## Before the FEDERAL COMMUNICATIONS COMMISSION Washington, DC 20554

In the Matter of	)	
	)	
Expanding the Economic and Innovation	)	WT Docket No. 12-268
Opportunities of Spectrum Through Incentive	)	
Auctions	)	

### COMMENTS OF T-MOBILE USA, INC.

Ari Fitzgerald Trey Hanbury Christopher Termini Philip Berenbroick **Hogan Lovells US LLP** 555 Thirteenth Street, NW Washington, DC 20004 (202) 637-5600

Attorneys for T-Mobile USA, Inc.

January 25, 2013

Thomas Sugrue
Kathleen O'Brien Ham
Steve Sharkey
Christopher Wieczorek
Indra Chalk
Joshua Roland **T-Mobile USA, Inc.**601 Pennsylvania Avenue, NW
Washington, DC 20004
(202) 654-5900

### TABLE OF CONTENTS

I.	INTRODI	UCTION	1			
II.	THE PROPOSED 600 MHZ BAND PLAN					
	A.	Interference and Design Considerations May Outweigh the Considerable Benefits of the Commission's Lead Band Plan.	5			
	В.	An Alternative Band Plan Would Capture Many of the Benefits of the Commission's Lead Band Plan Without the Same Risk of Harmful Interference and Increased Equipment Size and Cost.	10			
	C.	Five Megahertz Blocks, Paired Wherever Possible, Will Help Efficiently Transfer the Broadcast Spectrum to Broadband Use.	14			
	D.	The Use of Major Economic Area Licenses Would Reduce Transaction Costs, Decrease Complexity, and Accelerate Deployment While Still Allowing Opportunities for Small Bidders.	15			
III.	THE FOR	WARD AUCTION	18			
	A.	The Commission Should Adopt Bid Collection and Processing Procedures That Reduce the Cost of Participation, Accelerate the Execution of the Forward Auction, and Permit a High Degree of Price Discovery.	18			
	B.	Requiring Interoperability Across All Paired 600 MHz Channels Achieves Important Public Interest Benefits at Little to No Cost	21			
	C.	Assigning Channel Blocks in a Quasi-Random Assignment Process Would Promote Interoperability and Has the Potential to Clear More Spectrum and Increase Auction Revenues.	21			
	D.	The Commission Should Adopt and Apply a Cap on Spectrum Holdings Below 1 GHz to Determine Eligibility in the Forward Auction	23			
IV.	. THE REV	ERSE AUCTION	35			
	A.	The Commission Should Encourage Widespread Broadcaster Participation, But Preclude Those With Expired or Incomplete Licenses from Seeking to Capture Auction Revenues.	36			
	В.	The Reverse Auction Should Allow and Encourage Price Discovery by Broadcast Incumbents.	38			
	C.	Alternating the Reverse and Forward Auctions Will Promote Price Discovery and Accelerate the Auction Process.				
	D.	Optimum Bid Collection Procedures Must Balance Competing Considerations of Incentives, Responsiveness, Simplicity, Duration and Complexity	44			
	E.	The Reverse Auction Process Should Seek to Maximize the Availability of Population-Weighted Spectrum.	52			
	F.	In Responding to an Unsatisfied Clearing Rule, the Commission Should Adopt Auction-Design Choices that Maximize the Amount of Spectrum Available for Wireless Broadband.	56			
	G.	Conducting At Least Two Mock Auctions Will Assist Spectrum Sellers and Spectrum Buyers Navigate the Auction Process.	58			
V.	CONCLU	SION	60			

#### **EXECUTIVE SUMMARY**

The 600 MHz television broadcast incentive auction has the potential to change the wireless market for the better in the United States. Careful planning of three interrelated elements – the 600 MHz band plan, the reverse auction of television spectrum, and the forward auction of broadband spectrum to wireless carriers – can stimulate investment, promote competition, and accelerate mobile broadband deployment throughout the country.

### The Band Plan

Maximize Paired Spectrum. Any band plan the FCC adopts should maximize the amount of paired spectrum and minimize the need for guard bands. The Commission's lead proposal for the 600 MHz band plan maximizes the amount of paired spectrum and offers creative, pragmatic solutions to many of the myriad challenges presented. In particular, the proposal to maintain a consistent duplex spacing by standardizing the amount of downlink spectrum while varying the amount of uplink spectrum to account, in part, for variations in the amount of spectrum available from market to market simplifies equipment design and deployment. However, preliminary study of the plan also reveals some technical challenges that could be eased by an alternative plan that locates all paired spectrum above TV Channel 37. While this approach necessarily limits the amount of paired spectrum to seventy megahertz in a 2x35 MHz pairing, it avoids certain interference issues that exist with the Commission plan and encourages rapid development of interoperable consumer devices that meet consumer expectations for cost and size. Unless additional evidence removes the interference and design obstacles to the Commission's lead band plan, this T-Mobile band plan offers the best balance of competing factors to maximize the amount of paired 600 MHz spectrum in a way that facilitates rapid, cost-effective, ubiquitous broadband deployment.

Five-Megahertz, Fungible Building Blocks of Spectrum. The Commission should adopt its proposal to license the 600 MHz spectrum in fungible, five-megahertz "building blocks." Ensuring that all licenses use the same bandwidth and the same geographic area simplifies the auction, promotes the rapid transition of broadcast television spectrum to mobile broadband uses, and helps make the most efficient use of the band. In defining geographic area licenses, the Commission should use Major Economic Area ("MEA") licenses, rather than Economic Area ("EA") licenses. The 51 MEA license areas have a broader geographic footprint than the 176 EA license areas and would, therefore, allow carriers to deploy mobile broadband services throughout the country more quickly and more efficiently. Furthermore, using MEAs better reflects likely license aggregations and provides for a simpler, more robust auction, while minimizing transaction costs and reducing the need for complicated package bidding.

Interoperability Requirement. The Commission should promote interoperability across all paired 600 MHz band channels either by adopting an express interoperability requirement or by using a quasi-random assignment process to assign generic 600 MHz blocks. These measures would help prevent "boutique" band classes that reduce the availability, affordability, and portability of end user equipment; increase consumer switching costs; and delay the deployment of mobile broadband services.

#### The Forward Auction

To promote competition and improve consumer choice during the forward auction, the Commission should:

• Adopt a multiple-round, ascending clock auction that allows intra-round bidding and is sequenced to promote price discovery. Conducting the reverse and forward auctions in an alternating manner allows auction participants to develop a more informed understanding of spectrum supply and demand and should identify more spectrum for broadband use than other methods.

- Permit package bidding for geographic areas and unpaired spectrum blocks. Package bidding minimizes the risk that a bidder will win some licenses, but fail to win complementary licenses that are essential to the bidder's business plan.
- Adopt a spectrum cap to prevent the risk of excessive spectrum concentration, promote long-term competition, and encourage participation among all interested parties. A spectrum cap that prohibits a party from acquiring more than one-third of the spectrum below 1 GHz, applied on a market-by-market basis, would help avoid further spectrum consolidation that can undermine the competitive wireless marketplace. The Commission has clear statutory authority to establish such an eligibility rule and should exercise that authority to ensure the 600 MHz auction promotes competition, increases consumer choice, and expands the deployment of broadband throughout the country.

### The Reverse Auction

The Commission should adopt reverse auction rules that encourage widespread participation among broadcasters, including all full power and Class A broadcast licensees (commercial and non-commercial status alike).

To encourage truthful bidding in the reverse auction, increase broadcaster participation, and promote the timely and efficient reallocation of 600 MHz spectrum, the Commission should use Vickrey Pricing (or "threshold" pricing), in which all winning broadcasters in a market would receive the amount equal to what they could have bid to relinquish their spectrum rights and still had their bids accepted in the forward auction. An alternative model in which a winning broadcaster would receive the actual amount it bid would produce complicated bidding strategies, reduce efficiency, and create incentives for broadcasters to "shade" their bids.

Assuming the Commission employs a dynamic reverse auction, the opening bids for broadcast spectrum should be generous, except in those markets where sparse competition among broadcasters seems unlikely to result in competitive bidding. To establish opening bid prices, the Commission should consider the population covered, as well as other objective factors. The Commission should also consider establishing multiple opening bids if competition may not be sufficient to lead to efficient clearing prices. To enhance the dynamic auction model, the

Commission might consider a hybrid static-dynamic auction where broadcasters place sealed bids initially and participate in a dynamic auction in subsequent phases, if necessary.

The Commission should also adopt rules to maximize the availability of population-weighted spectrum. If aggregate forward auction bids do not cover the associated clearing costs, for example, the Commission should not necessarily adjust the spectrum-clearing target downward on a nationwide basis. Doing so would risk overlooking markets where forward-auction demand would exceed the cost of meeting the clearing target, such as in high-population areas. The Commission could instead establish benchmarks to determine how many areas not meeting the spectrum-clearing target will be allowed before it moves to a lower level of paired spectrum. For the same reasons, the Commission should reduce the spectrum target clearing level on a market-by-market basis rather than on national basis.

Finally, the Commission should incorporate clearing-rule satisfaction policies designed to maximize the amount of spectrum made available for broadband deployment if forward auction revenues initially do not cover the reverse auction costs. If a shortfall exists between cumulative auction bids and the amount necessary to meet a high spectrum-clearing target, the Commission should ask major forward-auction participants whether they are willing to cover the shortfall on a *pro rata* basis before the Commission reduces the spectrum-clearing target.

The Commission has advanced a thoughtful band plan and developed a sound framework for conducting the forward and reverse auctions. With modest refinements, the proposals promise to make a substantial contribution to the nation's inventory of broadband spectrum and establish a solid foundation for the type of service and quality competition that stimulates investment, spurs innovation, and benefits American consumers.

# Before the FEDERAL COMMUNICATIONS COMMISSION Washington, DC 20554

In the Matter of	)	
	)	
Expanding the Economic and Innovation	)	WT Docket No. 12-268
Opportunities of Spectrum Through Incentive	)	
Auctions	)	

#### COMMENTS OF T-MOBILE USA, INC.

#### I. INTRODUCTION

T-Mobile USA, Inc. ("T-Mobile") submits these comments in response to the Notice of Proposed Rulemaking ("Notice") issued by the Federal Communications Commission ("FCC" or the "Commission") in the above-captioned proceeding. An incentive auction that stimulates investment, promotes competition, and encourages the rapid deployment of mobile broadband service to the American public depends upon a carefully planned and implemented sequence of interrelated elements. The 600 MHz band plan, the reverse auction, and the forward auction all must work in concert to successfully reallocate spectrum from broadcast television to mobile broadband uses. A misstep in any one of these elements threatens the stated purpose of the Communications Act to make available "to all the people of the United States . . . a rapid,

<sup>&</sup>lt;sup>1</sup> Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Docket No. 12-268, *Notice of Proposed Rulemaking*, FCC 12-118 (rel. Oct. 2, 2012) ("*NPRM*").

<sup>&</sup>lt;sup>2</sup> See Ex Parte Letter from AT&T, Inc., Intel Corporation, National Association of Broadcasters, Qualcomm, T-Mobile, and Verizon Wireless to Gary Epstein and Ruth Milkman, GN Docket No. 12-268 (Jan. 24, 2013) (identifying key principles the Commission should follow in adopting any band plan).

efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges."

The stakes are high. The Commission currently considers 442 MHz of wireless broadband spectrum both "suitable" and "available" for mobile data and voice communications services. Of this total, less than one-third of the frequencies – fifty megahertz of cellular, fourteen megahertz of SMR, and eighty megahertz<sup>4</sup> of 700 MHz spectrum – exist in the highest-value, "beachfront" area below one gigahertz.<sup>5</sup> The Commission should obviously not "pick winners and losers" in an auction. Nor should it adopt a blanket exclusion of even dominant incumbents from the bidding process. At the same time, however, the Commission should structure its band plan and bidding processes to promote robust participation, aggressive bidding, and strong quality and service competition in the wireless market.

\_

<sup>&</sup>lt;sup>3</sup> 47 U.S.C. § 151; *see also* Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. 112-96 (Feb. 22, 2012) ("Spectrum Act"); 47 USC § 309(j) (requiring that the Commission, in designing auctions, promote "the development and rapid deployment of new technologies, products, and services for the benefit of the public" and "ensur[e] that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses").

<sup>4</sup> While at times eighty megahertz of 700 MHz spectrum has been identified as suitable and available for mobile telephony and broadband use, this finding does not take into account changes

available for mobile telephony and broadband use, this finding does not take into account changes in band use, such as the statutory reallocation of ten megahertz of 700 MHz spectrum from commercial to public safety use.

<sup>5</sup> The Commission has indicated that spectrum suitable and available for mobile telephony and

The Commission has indicated that spectrum suitable and available for mobile telephony and mobile broadband services includes cellular (50 MHz), PCS (120 MHz), SMR (26.5 MHz), and 700 MHz (80 MHz) spectrum, as well as AWS-1 (90 MHz) and BRS (55.5 MHz) spectrum where available for mobile services. *See* Application of AT&T Inc. and Qualcomm Inc. for Consent to Assign Licenses and Authorizations, *Order*, 26 FCC Rcd 17589 ¶ 39 (Dec. 22, 2011). Recently, the Commission also determined that 20 MHz of Wireless Communications Service ("WCS") spectrum is suitable and available. Applications of AT&T Mobility Spectrum LLC, New Cingular Wireless PCS, LLC, Comcast Corporation, Horizon Wi-Com, LLC, NextWave Wireless, Inc., and San Diego Gas & Electric Company for Consent to Assign and Transfer Licenses, *Memorandum Opinion and Order*, WT Docket No. 12-240, FCC 12-156 ¶ 31 (Dec. 18, 2012). Adding these amounts together yields 442 MHz of suitable and available spectrum, where AWS-1 and BRS spectrum are available. Based on this amount of spectrum, the Commission has explained that the screen is triggered where applicants have "151 megahertz or more of spectrum where both AWS-1 and BRS spectrum are available." *Id.* ¶ 32 n.94.

The Commission has an opportunity in this proceeding to achieve each of these public interest goals. A successful incentive auction could nearly double the amount of low-frequency, high-value broadband spectrum for the wireless industry. This increase in broadband capacity would not only allow wireless providers to offer progressively faster, more innovative broadband services, but also increase employment and contribute to the nation's total productivity. Recon Analytics, for example, estimates that every ten additional megahertz of spectrum available for wireless broadband use increases the United States' gross domestic product by \$1.739 billion.<sup>6</sup> Other analysts have identified similar economic benefits. LECG Research, for instance, asserts that every one percent increase in broadband penetration can result in a 0.1% productivity gain in the overall economy.<sup>7</sup>

The revenue consequences for the Department of Treasury are also considerable. Auction receipts for existing wireless spectrum have provided American taxpayers with more than \$50 billion. With the growing demand for wireless spectrum, gross revenue for the incentive auction spectrum could exceed \$24.5 billion, according to the Congressional Budget Office. But the benefits of the auction for the public extend well beyond its potential revenue proceeds. As Chairman Genachowski recently noted, "economists regard the economic value created by FCC

\_

<sup>&</sup>lt;sup>6</sup> See Recon Analytics, The Wireless Industry: The Essential Engine of US Economic Growth (2012), available at <a href="http://reconanalytics.com/wp-content/uploads/2012/04/Wireless-The-Ubiquitous-Engine-by-Recon-Analytics-1.pdf">http://reconanalytics.com/wp-content/uploads/2012/04/Wireless-The-Ubiquitous-Engine-by-Recon-Analytics-1.pdf</a>.

<sup>&</sup>lt;sup>7</sup> See LECG, Economic Impact of Broadband: An Empirical Study 4 (2009), available at <a href="http://www.connectivityscorecard.org/images/uploads/media/Report\_BroadbandStudy\_LECG\_March6.pdf">http://www.connectivityscorecard.org/images/uploads/media/Report\_BroadbandStudy\_LECG\_March6.pdf</a>.

<sup>&</sup>lt;sup>8</sup> See John Eggerton, CBO Says Incentive Auctions Will Produce 6.5B for Treasury, Broadcasting & Cable, July 20, 2012, available at <a href="http://www.broadcastingcable.com/article/471319-CBO Says Incentive Auctions Will Produce 6 5B for Treasury.php">http://www.broadcastingcable.com/article/471319-CBO Says Incentive Auctions Will Produce 6 5B for Treasury.php</a> (estimating the incentive auctions to "yield \$6.5 billion toward deficit reduction out of a total estimated take of \$24.5 billion after compensating licensees for exiting").

auctions as being about 10 times" the value obtained at auction, which could mean more than \$245 billion in United States consumer surplus as a result of the incentive auction.

The auction design choices the Commission makes in this proceeding will fundamentally affect the mobile wireless industry. Band plan design decisions that provide insufficient paired spectrum could create lasting technical barriers to broadband deployment in the 600 MHz band and thwart innovative competitors from offering expanded broadband services. Reverse auction design choices that discourage participation could relegate valuable spectrum resources to low-value uses for years to come. And forward auction design criteria that do not sufficiently encourage investment and innovation from competitive carriers could push the industry away from the robust competition that has characterized the mobile market for the last fifteen years and toward a higher-cost, lower-innovation market dominated by the two largest incumbents. Taken together, the Commission faces a daunting task in designing a successful broadband incentive auction. T-Mobile looks forward to a robust dialogue on how to structure the band plan, the reverse auction, and the forward auction to best encourage participation, promote aggressive bidding, and introduce additional price, quality, and service competition into the wireless market.

#### II. THE PROPOSED 600 MHZ BAND PLAN

The Commission's lead proposal for the 600 MHz band plan has considerable merit, and T-Mobile endorses many of its elements and principles. Nevertheless, the potential for harmful interference to and from incumbent broadcasters, as well as handset-design and performance considerations inherent in the plan, may outweigh its benefits compared to alternative plans. Modifying the lead band plan by moving the downlink pairing above TV Channel 37 would

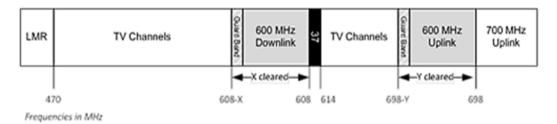
<sup>&</sup>lt;sup>9</sup> Statement of Chairman Julius Genachowski, Federal Communications Commission, Hearing on the FCC's Fiscal 2013 Budget Request Before the Subcommittee on Financial Services and General Government, Committee on Appropriations, U.S. House of Representatives (Mar. 19, 2012), *available at* <a href="http://transition.fcc.gov/Daily\_Releases/Daily\_Business/2012/db0319/DOC-313081A1.pdf">http://transition.fcc.gov/Daily\_Releases/Daily\_Business/2012/db0319/DOC-313081A1.pdf</a>.

provide substantially similar benefits as the lead band plan while mitigating potential harmful interference and technical impediments.

### A. Interference and Design Considerations May Outweigh the Considerable Benefits of the Commission's Lead Band Plan.

The Commission's lead band plan proposal offers wireless carriers three critical benefits: (1) paired spectrum that maximizes the utility of the spectrum for wireless broadband; (2) a fixed amount of downlink spectrum that reduces complexity and cost in user equipment; and (3) supplemental downlink spectrum for asymmetric pairing that could be well-suited for high datarate downlink applications, such as video-streaming.

In the Commission's lead proposal for the 600 MHz band plan, the uplink band would begin at Channel 51 (698 MHz) and expand downward while the downlink band would begin at Channel 36 (608 MHz) and expand downward. Finally, Channel 37 – together with any broadcast incumbents unable to relocate to lower frequencies – would fall inside the duplex gap between the uplink and downlink segments.



Of its many benefits, the Commission's lead band plan would maximize the amount of spectrum that could be paired for broadband use. Maximizing the availability of paired spectrum increases the likelihood of robust competition by allowing both established licensees, who are interested in expanding their geographic coverage area, and new entrants, who seek to provide services to customers for the first time, to acquire all the critical spectrum inputs needed for their business at once. Pairing the spectrum allows mobile broadband providers to deploy and expand their next-generation services more quickly and efficiently. Absent a paired allocation, new and

expanding entrants would need to spend considerable resources acquiring the downlink portion without any assurance that they could acquire the return-link spectrum in other bands. The resulting exposure risk would deter auction participation and competition. By offering robust amounts of paired spectrum, the Commission's lead band plan minimizes exposure risk and increases the likelihood that consumers will be able to enjoy more extensive broadband services from a wider array of potential competitors.

Another benefit of the Commission's lead band plan is its uniform amount of downlink spectrum. This aspect of the plan reduces handset complexity and the need for multiple distinct band plans. Most importantly, it will speed deployment of interoperable devices in the reallocated 600 MHz spectrum. As reflected in the *Notice*, the "proliferation of band plans is often considered undesirable from a technical perspective . . . because each band plan typically requires a different design of the filters and/or duplexers in mobile devices to support those band plans." 10 consistent amount of nationwide downlink spectrum, with a variable amount of uplink spectrum, will facilitate interoperability by ensuring that devices operating in the 600 MHz band can use the same fundamental radio frequency components. Although a variable amount of uplink spectrum will require base stations to contain potentially different radio frequency components, it is far less costly to implement receive-filtering in base stations in geographically distinct markets than in mobile devices, which are generally sold nationwide, as the Commission has noted. 11 Consequently, offering a uniform amount of downlink spectrum would encourage network deployment, promote competition, and reduce the risk that consumers will be forced to purchase devices that are capable of operating only in a narrow geographic area or on a select few networks.

<sup>&</sup>lt;sup>10</sup> *Id*. ¶ 137.

<sup>&</sup>lt;sup>11</sup> *Id.* ¶ 138.

The Commission's lead band plan also offers supplemental downlink spectrum for asymmetric pairing, which could be useful for high data-rate downlink applications, such as video-streaming, 12 and which delivers additional broadband capacity gains when the downlink is the limiting network element in the consumer experience. Nevertheless, using any supplemental downlink technology in 600 MHz would still require that the downlink be used in conjunction with paired spectrum in another band. Due to handset antenna constraints, moreover, that band likely needs to be above 1 GHz. Therefore, supplemental downlink spectrum remains a decidedly inferior option compared to paired spectrum use of the 600 MHz band. Nevertheless, combining unpaired downlink-only spectrum with additional and existing paired spectrum could make use of "odd lot" spectrum that will result from irregular levels of TV broadcast spectrum clearing. 13

Finally, the Commission's band plan offers a high degree of flexibility for future changes that may occur in both the wireless and broadcast industries. Unlike many of the alternative band plans, the Commission's lead band plan can accommodate both low and high degrees of broadcast relocation without requiring excessive reworking of the band for each possible configuration. Specifically, the Commission's lead band plan can accommodate as little as one broadband channel to, in theory, as many as sixteen paired, five-megahertz channels, or a total of 160 megahertz of spectrum. This flexibility is one of the main practical benefits of the Commission's lead band plan. Even if the broadcast incentive auction does not generate as much broadband spectrum as is hoped, the Commission's lead band plan allows for the possibility of success and, just as important, allows for the possibility that subsequent changes in the broadcast industry might make additional spectrum available for broadband use over time.

-

<sup>&</sup>lt;sup>12</sup> See, e.g., Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band, Notice of Proposed Rulemaking, 22 FCC Rcd 17035, 17046-47, 17050 ¶¶ 21, 29 (2007).

 $<sup>^{13}</sup>NPRM \ \ 134.$ 

Although the Commission's lead band plan sensibly proposes to configure the 600 MHz spectrum blocks in a manner that reallocates as much spectrum as possible for mobile broadband use, produces the maximum amount of paired spectrum possible, and licenses the remainder unpaired spectrum for use as supplemental downlink, it also presents some significant challenges, most notably harmful interference concerns and equipment design issues.

First, the introduction of high-power broadcast operations within the duplex gap appears to create a substantial risk of harmful interference to broadband operations and broadcast incumbents. High-power broadcast operations could generate harmful interference into broadband user equipment, and base stations and cellular broadband operations could generate harmful interference into sensitive television receivers. While the precise interference and interference-mitigation mechanisms at issue deserve further scrutiny, T-Mobile's initial analysis suggests that injecting high-power transmitters into a relatively narrow duplex gap would pose significant design and implementation complexity for broadband providers. Subsequent analysis may demonstrate that these issues can be overcome through sound engineering practices and T-Mobile would welcome such additional evidence during the course of the proceeding. At present, however, the information available suggests that the risk of harmful interference warrants further scrutiny and, absent record evidence demonstrating the feasibility of operating high-power television within the 600 MHz band duplex gap, counsels against adoption of the Commission's lead band plan.

Second, assuming the potential for interference could be successfully managed through improved filters or other techniques, the Commission's lead band plan would still span a wide range of 600 MHz spectrum. While this arrangement maximizes the amount of spectrum that can

be paired despite the presence of operations remaining in TV Channel 37,<sup>14</sup> it poses serious antenna-design challenges for manufacturers. As Avago Technologies has elsewhere noted, most antennas are simple dipoles with a center-fed element. For these antennas to perform effectively, their physical dimensions must correspond to a certain fraction of a wavelength being radiated. Lower frequencies have longer wavelengths – and, thus, larger antennas – than higher frequencies do. This fact results in a legitimate but not insurmountable challenge to antenna design for handsets in the 600 MHz band.

Multiple equipment manufacturers have indicated to T-Mobile that the Commission's lead band plan would require equipment manufacturers to incorporate at least two low-frequency antennas into their devices. Today, many handsets include a single antenna that supports the Cellular (850 MHz) and 700 MHz bands. To support the 600 MHz band above Channel 37, manufacturers already will have to optimize the low-band antenna in an existing device or potentially add a second low-band antenna to the device. However, separating the uplink and downlink with a relatively larger amount of spectrum by placing the downlink below TV Channel 37 will almost certainly prevent a single antenna from effectively covering the entire range of frequencies. Consequently, the Commission band plan requires the use of at least two low-band antennas. Multiple antennas would increase the size, weight, and cost of handsets – design considerations strongly disfavored by consumers. This challenge to both manufacturers and carriers should be avoided so long as an alternative band plan option exists that can still bring substantial paired spectrum to market.

It appears cost prohibitive to relocate incumbent services from TV Channel 37 based on the Commission's analysis. NPRM ¶¶ 200-214.

## B. An Alternative Band Plan Would Capture Many of the Benefits of the Commission's Lead Band Plan Without the Same Risk of Harmful Interference and Increased Equipment Size and Cost.

While T-Mobile remains amenable to further studying and potentially endorsing the Commission's lead band plan, an alternative band plan focused on frequencies between 614 MHz and 698 MHz (*i.e.*, Channels 37 through 51) may achieve many of the benefits of the Commission's lead band plan, but with fewer technical impediments. T-Mobile proposes to establish a thirty-five megahertz uplink allocation (663-698 MHz) with a thirty-five megahertz downlink allocation (618-653 MHz) within the 614-698 MHz band. A ten megahertz duplex gap would separate the uplink and downlink frequencies.

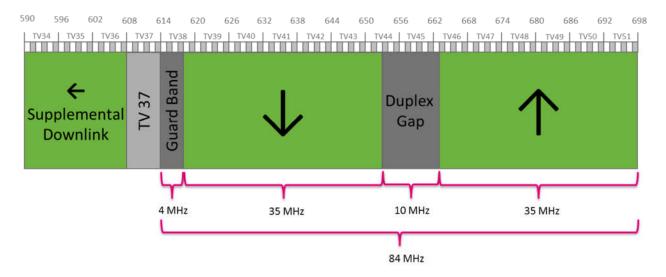


Figure 1: T-Mobile Alternative Band Plan Proposal

The primary goal of the T-Mobile band plan is to maximize the availability of paired spectrum essential for rapid, self-sufficient 4G LTE deployment while eliminating or reducing technical challenges and the need for significant guard bands. Where it is not feasible to use cleared spectrum for paired use, the plan provides asymmetric downlink-only spectrum that can supplement paired LTE operations in other bands. Expanding the availability of paired, low-

frequency spectrum has the potential to improve value, service, and broadband coverage offered to customers in urban, suburban, and rural environments.

Under the T-Mobile band plan, the paired, thirty-five megahertz of spectrum – comprised of seven paired, five-megahertz blocks – would be accommodated above TV Channel 37, with the uplink extending down from 689 MHz, the duplex gap at 653-663 MHz, and the downlink at 618-653 MHz. Similar to the Commission's lead band plan, the T-Mobile band plan would provide for a common swath of downlink spectrum. Even markets with as few as ten cleared broadcast channels would enjoy access to thirty-five megahertz of downlink spectrum for either asymmetric downlink use or possible pairing should the paired uplink become available at a later time. Also like the Commission's lead plan, the T-Mobile plan would place the 600 MHz band uplink spectrum adjacent to the 700 MHz band uplink spectrum where feasible. This juxtaposition of 600 MHz and 700 MHz uplinks eliminates the need for a guard band that would be necessary if the 600 MHz downlink were placed adjacent to the 700 MHz uplink.

In markets with less than eighty-four megahertz cleared (or, stated differently, in markets with fewer than fourteen television channels cleared), insufficient spectrum exists under the T-Mobile proposal to make seventy megahertz of paired spectrum available. In such markets, the T-Mobile band plan also prioritizes downlink spectrum over uplink spectrum and preserves a common duplexer frequency for the 600 MHz band by incorporating minimal guard band on either side of the television incumbents' spectrum. Like the Commission's lead band plan, the T-Mobile

<sup>&</sup>lt;sup>15</sup> Ongoing analysis may permit enhancements of this configuration to deliver additional spectrum for licensed broadband use. For example, if the duplex gap can be reduced to nine megahertz in width without creating harmful interference, the T-Mobile band plan could accommodate an additional five megahertz block of downlink-only spectrum above Channel 37. Conversely, if interference considerations suggest the duplex gap should be increased, the four megahertz of guard band above Channel 37 could be used to create additional separation between uplink and downlink frequencies.

band plan then provides for as much uniform downlink spectrum as possible to ease interoperability and maximize device commonality.

If the incentive auction proves successful at clearing in excess of eighty-four megahertz of spectrum, the T-Mobile band plan would make this spectrum available for supplemental downlink in five-megahertz increments below Channel 37. Moreover, similar to the Commission's lead band plan, the T-Mobile plan would replace high-power broadcast downlink operations near Channel 37 with lower-power broadband downlink operations. With reasonable filter designs and service rules, this arrangement could eliminate the need for additional guard band spectrum for the benefit of Channel 37 operations and make coexistence with Channel 37 operations easier. This arrangement would also eliminate the need for a costly (and, for radio astronomy, potentially infeasible) relocation of incumbent Channel 37 operators to other frequencies.

Critical to the success of the T-Mobile plan is the implementation of seven, paired five megahertz blocks of spectrum for a total of thirty-five megahertz each for uplink and downlink use wherever possible. A total paired broadband allocation of seventy megahertz permits up to three potential competitors to assemble spectrum in paired 2x10 MHz blocks while still allowing for an additional 2x5 MHz block to supplement those holdings or allow room for a fourth competitor to implement a coverage-type network. By comparison, smaller pairings of 2x25 MHz (fifty megahertz total) or 2x20 MHz (forty megahertz total) would allow only two carriers to offer robust 2x10 MHz networks. Aside from the obvious drawbacks that providing less broadband would have on competition, making less broadband spectrum available threatens diminished economic opportunity, lower job growth, and reduced tax revenue for the United States.

As for technical limitations, no meaningful technical impediments appear to jeopardize the viability of a paired, thirty-five megahertz allocation above Channel 37. Potential harmonic and intermodulation interference, for example, appear to be manageable with sound engineering

practices. And reasonable allowances for guard band and duplex gap of six and ten megahertz, respectively, can still be accommodated consistent with a maximalist, seventy-megahertz approach to paired spectrum above Channel 37.

In short, the T-Mobile band plan builds on many of the strengths of Commission's preferred band plan, but avoids the problems associated with introducing high-power television operations into the duplex gap and the design challenges associated with an antenna spanning such a considerable frequency range. Nevertheless, if unforeseen policy or technical constraints were to prevent the Commission from licensing 2x35 MHz in markets where sufficient cleared spectrum is available, many of the benefits of the T-Mobile band plan would not be realized, and alternative band plans should be considered. In other words, without a potential 2x35 MHz broadband spectrum opportunity from the broadcast incentive auction, other band plans, including the Commission's lead band plan, may well achieve more benefits with fewer costs, despite the additional design and technical considerations that would need to be addressed.

No spectrum band plan is perfect, of course. All possible band plans involve trade-offs, and the T-Mobile band plan is no exception. But based on the information available so far, T-Mobile's band plan would maximize paired spectrum while balancing the technical realities of developing cost-effective mass-market end-user equipment. Absent additional evidence concerning the technical and design feasibility of the Commission's lead band plan, therefore, the Commission should adopt the plan that creates a thirty-five megahertz uplink allocation and a thirty-five megahertz downlink allocation in the 614-698 MHz band.

## C. Five Megahertz Blocks, Paired Wherever Possible, Will Help Efficiently Transfer the Broadcast Spectrum to Broadband Use.

The Commission should adopt its proposal to license the reallocated 600 MHz spectrum in fungible five megahertz "building blocks." Ensuring all licenses use the same bandwidth and the same geographic area unit would help achieve the Commission's goals to "maximize utility and allow for efficient use of the band," "optimize . . . the efficiency with which the spectrum usage rights in the relinquished broadcast television spectrum can be rebanded," and facilitate "the process of transitioning from broadcast to mobile broadband use." The Commission has long pursued policies to ensure that "spectrum is as fungible, tradable, and marketable as possible." By adopting fungible, five megahertz blocks that use a common geographic unit, the Commission can substantially mitigate the negative effects of not knowing the amount of spectrum that will be reallocated for flexible use at the outset of the forward auction.

Licensing the 600 MHz spectrum in five megahertz blocks also will "allow for the greatest amount of flexibility and efficiency" for several reasons. <sup>19</sup> First, five megahertz blocks are sufficiently large to "support a variety of wireless broadband technologies," and would allow for "channel aggregation," in which smaller channels can be bonded together for greater performance,

 $<sup>^{16}</sup>$  NPRM ¶ 128.

<sup>&</sup>lt;sup>17</sup> *Id.* ¶ 127.

<sup>&</sup>lt;sup>18</sup> See Amendment of Parts 1, 21, 73, 74, and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, WT Docket No. 03-66, Order on Reconsideration and Fifth Memorandum Opinion and Order and Third Memorandum Opinion and Order and Second Report and Order, 21 FCC Rcd 5606, 5720 ¶ 278 (2006); Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, WT Docket No. 00-230, Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 20604, 20634 ¶ 62 (2003) (noting the advent of "technological advances . . . that are making spectrum use increasingly divisible, fungible, and capable of being accessed in various dimensions . . . by different users on different systems").

<sup>&</sup>lt;sup>19</sup> *NPRM* ¶ 128.

particularly for advanced mobile broadband applications such as LTE.<sup>20</sup> Second, licensing in five megahertz blocks would ease the conversion of broadcast television licenses to flexible-use mobile channels because they are close in size to the six megahertz broadcast channels that will be relinquished in the reverse auction.<sup>21</sup> The technical flexibility, channel-size similarity, and geographic continuity will help ensure that the greatest possible amount of the reclaimed spectrum can be repurposed for mobile broadband use across a variety of mobile technologies, despite the inherent uncertainty over how much spectrum the auction will repurpose in any market.

## D. The Use of Major Economic Area Licenses Would Reduce Transaction Costs, Decrease Complexity, and Accelerate Deployment While Still Allowing Opportunities for Small Bidders.

The Commission should license the relinquished 600 MHz spectrum by Major Economic Area ("MEA"), rather than by Economic Area ("EA"), <sup>22</sup> because the use of MEA licensing would yield a number of significant public interest benefits. <sup>23</sup> First, licensing by MEA would meet the needs of most wireless carriers. Customer demand and carrier competition indicate that the economically efficient size of wireless service is substantially larger than individual EAs and generally even larger than MEAs, although MEAs can be used as building blocks for efficient size service areas. Most carriers today are interested in creating a large regional or nationwide service

\_

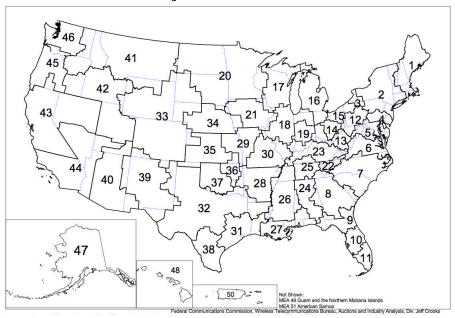
<sup>&</sup>lt;sup>20</sup> *Id.* ¶¶ 127-128 (explaining that the technologies supported by 5x5 megahertz paired blocks include Wideband-Code Division Duplex Access (W-CDMA), High Speed Packet Access (HSPA), and their variants, as well as Long Term Evolution (LTE)).

<sup>&</sup>lt;sup>21</sup> *Id*. ¶ 128.

<sup>&</sup>lt;sup>22</sup> *Id*. ¶ 148.

<sup>&</sup>lt;sup>23</sup> Despite the benefits of licensing by MEA, the Commission should continue to license Alaska, Hawaii, and other areas outside of the continental United States by EA because those areas are fully contained by single EAs and are not part of a larger MEA.

### **Major Economic Areas**



footprint – a feature that "may be especially important for new entrants"<sup>24</sup> as well as for existing operators that are diligently expanding service. As the Commission has previously recognized, "the use of large geographic service areas helps reduce transaction costs for both auction participants seeking to aggregate adjoining smaller geographic areas at auction and licensees seeking to consolidate such areas post auction."<sup>25</sup> The Commission has likewise acknowledged that larger geographic licensing areas "help lower the costs of acquiring a larger customer base to achieve economies of scale," which in turn enables licensees "to offer new and innovative services."<sup>26</sup> The Commission's statement comports with industry experience – virtually any

<sup>&</sup>lt;sup>24</sup> Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, *Second Report and Order*, FCC 07-132 ¶ 81(rel. Aug. 10, 2007) ("700 MHz Second R&O").

<sup>&</sup>lt;sup>25</sup> *Id.*; *see also*, *e.g.*, Peter Cramton, *Why Large Licenses Are Best for the 700 MHz Spectrum Auction* (Apr. 17, 2007), *available at* <a href="http://www.cramton.umd.edu/papers2005-2009/cramton-700-mhz-large-licenses.pdf">http://www.cramton.umd.edu/papers2005-2009/cramton-700-mhz-large-licenses.pdf</a> (noting that spectrum "aggregation requires negotiations between separate parties, which can sometimes be frustrated by holdouts or delayed as part of negotiation tactics.").

 $<sup>^{26}</sup>$  700 MHz Second R&O ¶ 82.

competitive carrier will need a service territory much larger than a single EA; therefore, MEA geographic license areas make the most economic sense.

Second, licensing by MEA would also simplify the auction by reducing the need for package bidding that could be necessary to prevent the exposure problem associated with smaller geographic areas. <sup>27</sup> As the Commission has explained, "package bidding options generally complicate an auction." Licensing by EA would pose a substantial exposure risk for mobile carriers seeking to deploy service over a larger area because these carriers would need to acquire spectrum blocks across multiple, contiguous EAs. Licensing by MEA would eliminate much of this complexity and reduce the geographic exposure risk that could reduce bidding substantially and, therefore, reduce the need for package bidding.

Third, licensing the 600 MHz spectrum by MEA would not foreclose the options available to parties interested in providing service within a smaller geographic area. MEAs are not so large that licensing 600 MHz spectrum on this basis would preclude smaller- and medium-sized operators from competing for or acquiring the spectrum at auction.<sup>29</sup> Additionally, because the Commission will likely impose meaningful performance requirements for the spectrum, spectrum partitioning, disaggregation, and leasing should remain viable options for parties interested in smaller geographic area licenses.<sup>30</sup>

<sup>&</sup>lt;sup>27</sup> See infra Section III. A. 2.

 $<sup>^{28}</sup>$  *NPRM* ¶ 62.

 $<sup>^{29}</sup>$  700 MHz Second R&O ¶ 81 (noting that licensing by REAG – a geographic area that is substantially larger than an MEA – has not precluded medium-sized providers from acquiring spectrum at auction).

<sup>&</sup>lt;sup>30</sup> As noted in the NPRM, the flexibility afforded by partitioning and disaggregation "could facilitate the efficient use of spectrum by providing licensees with the flexibility to make offerings directly responsive to market demands for particular types of services, increase competition by allowing market entry by new entrants, and expedite provision of services to areas that might not otherwise receive service in the near term." NPRM ¶ 385.

### III. THE FORWARD AUCTION

The bidding mechanisms the Commission adopts for the 600 MHz band have the potential to alter the structure of the wireless market. To varying degrees, the choices the Commission makes with respect to bid collection and processing can either enhance competition and improve consumer welfare or foreclose competitive entry and curtail consumer choice. The Commission should adopt forward auction policies that increase competition and permit wireless markets to operate more efficiently.<sup>31</sup>

A. The Commission Should Adopt Bid Collection and Processing Procedures That Reduce the Cost of Participation, Accelerate the Execution of the Forward Auction, and Permit a High Degree of Price Discovery.

To harness its goal of "repurpos[ing] the maximum amount of UHF band spectrum for flexible licensed and unlicensed use," <sup>32</sup> the Commission should adopt bid collection and processing procedures that encourage a high degree of bidder participation, expedite the auction of reclaimed broadcast spectrum, and promote auction efficiency. <sup>33</sup> As Appendix C of the *Notice* made clear, "a faster Forward Auction is valuable because the outcome of the Reverse Auction cannot be determined until the nearly completed forward auction lets the Commission decide how much it can afford to pay to clear spectrum." <sup>34</sup> Consequently, delays in the forward auction could

<sup>-</sup>

<sup>&</sup>lt;sup>31</sup> See generally Thomas W. Hazlett & Roberto E. Munoz, A Welfare Analysis of Spectrum Allocation Policies, available at <a href="http://www.arlingtoneconomics.com/studies/Rand">http://www.arlingtoneconomics.com/studies/Rand</a> TH RM 12 5 08.pdf.

 $<sup>^{32}</sup>$  *NPRM* ¶ 10.

<sup>&</sup>lt;sup>33</sup> In the *Notice*, the Commission described potential bid collection procedures, including the possibility of auctioning "generic" rather than specific spectrum licenses in each geographic area, the differences between two dynamic auction formats, and the benefits and complications of offering the option to submit package bids. *See id.* ¶¶ 56-62.

<sup>&</sup>lt;sup>34</sup> *Id.*, Appendix C at 4 ("Appendix C").

increase the costs of, and discourage participation in, the reverse auction, which would further reduce the amount of spectrum that can be reclaimed for mobile broadband.<sup>35</sup>

## 1. <u>The Sale of Fungible Spectrum Licenses Will Reduce Complexity</u> and Accelerate the Auction Process.

One of the means by which the Commission can accelerate the forward auction and reduce the cost of bidder participation is by offering "generic," fungible spectrum licenses that are not frequency-specific within each geographic area. As reflected in the *Notice*, collecting bids for generic licenses in different categories of licenses (such as paired and unpaired) would "reduc[e] the time and, therefore, the cost of bidder participation, since bidders would no longer need to iteratively bid on the least expensive of several specific but suitable licenses, as in a typical FCC SMR ['simultaneous multiple round'] auction." Speed is particularly important to the design of the incentive auction in light of the "interdependence of the reverse and forward auctions." Moreover, by obviating the need for bidders to engage in complex strategies of iterative bidding for different licenses within a single market, offering generic, non-frequency specific licenses would encourage participation from a diverse number of interested parties in the forward auction. More forward-auction participants can, in turn, stimulate greater broadcaster participation in the reverse auction and increase the amount of spectrum available for mobile broadband use, consistent with the Commission's objective in this proceeding. The proceeding of the forward auction and increase the amount of spectrum available for mobile broadband use, consistent with the Commission's objective in this proceeding.

\_

<sup>&</sup>lt;sup>35</sup> See id.

<sup>&</sup>lt;sup>36</sup> See NPRM ¶¶ 56, 61.

 $<sup>^{37}</sup>$  Id

<sup>&</sup>lt;sup>38</sup> For this reason, T-Mobile also encourages the Commission to ensure equipment compatibility across the 600 MHz band, as discussed further below. *See infra* Section III. B.

## 2. <u>The Commission Should Allow Package Bidding for Geographic Areas and Unpaired Blocks.</u>

To ensure the incentive auction assigns spectrum resources to the highest and best use in the most cost-effective manner possible, the Commission should incorporate package bidding for combinations of geographic areas and combinations of unpaired downlink spectrum blocks with paired blocks. Without some mechanism to acquire a minimum economically efficient aggregation of licenses, companies' winnings could fall short of what is needed to compete effectively in the 600 MHz band and the risk of such an outcome could frustrate competition in the market and in the auction.

Package bidding can minimize these risks. As the Commission noted, "[p]ackage bidding could be particularly helpful to bidders that face a risk of winning certain licenses but losing complementary licenses they consider essential to their business plans." Mitigating this risk and allowing bidders the opportunity to make package bids that are contingent on obtaining other spectrum units would encourage broader auction participation, increase auction revenues, and enable greater efficiencies for carriers seeking to deploy 600 MHz service across a wide footprint. Particularly if the Commission adopts geographic licensing areas smaller than MEAs, therefore, package bidding for combinations of geographic-area licenses and combinations of

\_

 $<sup>^{39}</sup>$  *NPRM* ¶ 62.

<sup>&</sup>lt;sup>40</sup> See Spectrum Exchange Group, LLC, FAQs about Ascending Auctions with Package Bidding 1 (2000) (explaining that the "exposure problem" occurs when a bidder faces the risk of acquiring only some of the licenses that are necessary to carry out its business plan. If the bidder fails to acquire some of the licenses it needs, the complimentary licenses the bidder acquires are not worth the prices paid); see also Christoph Brunner et al., An Experimental Test of Flexible Combinatorial Spectrum Auction Formats 2 (2007) (describing how package bidding eliminates the exposure problem by allowing bidders to submit bids that include combinations of complimentary licenses and allow the bidder to either win the entire package or nothing at all, and "as a result, bids can reflect value complementarities, which should raise efficiency and seller revenue").

paired and unpaired blocks can reduce uncertainty and minimize the risk that bidders will wind up with licenses they cannot economically use.

### B. Requiring Interoperability Across All Paired 600 MHz Channels Achieves Important Public Interest Benefits at Little to No Cost.

The Commission should require interoperability across all paired 600 MHz band channels. The benefits of requiring interoperability are great and cost little to nothing, especially at the outset of band development. Interoperability promotes consumer choice, carrier competition, and the public interest in ubiquitous, reliable communications. For consumers, interoperability promises increased competition in pricing and services through a greater ability to switch among competing carriers. For competitive carriers, interoperability can enhance economies of scale, expand roaming opportunities, and increase deployment of next-generation broadband services across the country, especially in rural areas. Interoperability also helps promote the public interest by ensuring that more than one carrier can offer service to large categories of users in the event of a disaster or other system-disabling event. Finally, interoperability can also stimulate investment, create jobs, and spur innovation by expanding the ecosystem of devices and network equipment and reducing development costs through the benefits of expanded scale economies.

## C. Assigning Channel Blocks in a Quasi-Random Assignment Process Would Promote Interoperability and Has the Potential to Clear More Spectrum and Increase Auction Revenues.

The Commission should use a quasi-random assignment process for the assignment of the generic 600 MHz blocks. Assigning blocks in a quasi-random fashion would help achieve much the same result as an interoperability rule: namely, the elimination of the ability to create custom-designed or "boutique" band classes that constrain consumers' ability to switch among different carriers' service offerings and limit the capacity for communications redundancy and reliability in the event of a disaster or other event that disables some, but not all, service providers in the 600 MHz band. Under this framework, the Commission randomly would assign spectrum blocks to

winning bidders. If the Commission uses MEAs, specific spectrum blocks could be assigned on a fully random basis. If the Commission uses geographic licensing units smaller than MEAs, specific spectrum blocks could be assigned on a quasi-random basis where some effort is made to maintain the same frequency over an MEA-sized area simply for administrative simplicity.

Random or quasi-random assignment would encourage interoperability. Because no one carrier would hold all the spectrum on a particular frequency, no one carrier could create a custom-made or "boutique" band class capable of operating only on its licensed frequencies after the close of the auction. Absent precautions to preserve interoperability in the 600 MHz band, multiple boutique band classes may emerge that reduce the incentive for device manufacturers to develop handsets that are available to all licensees in the band. The need to avoid this scenario – and to promote interoperability – is especially important as commercial operators migrate to the common LTE platform.<sup>41</sup>

Using a random or quasi-random assignment process would not only avoid the risk of fractious, incompatible network operations in the 600 MHz band, but also would clear more broadband spectrum and has the potential to increase auction prices. Bidders typically approach auctions with a fixed budget. Forward auction bidders that face not one, but *two*, separate forward auctions – one for acquisition and another for assignment – will reduce their initial acquisition auction prices based on the level of bids and bidding activity anticipated in the assignment auction. While reductions will surely vary by bidder, acquisition auction participants are likely to withhold some amount of spending that would have otherwise gone into spectrum acquisition in reserve for the spectrum assignment round. The reduced acquisition auction revenues would run counter to the interests of broadcast incumbents, who would see funds siphoned from the process

-

<sup>&</sup>lt;sup>41</sup> *T-Mobile Sixteenth Report Comments* at 18-19.

of acquiring spectrum from broadcasters into the process of assigning the pool of spectrum among winning bidders. Perhaps worse, the reduced acquisition auction revenue also risks thwarting the important public policy goal of clearing the maximum amount of encumbered spectrum for next-generation broadband use.

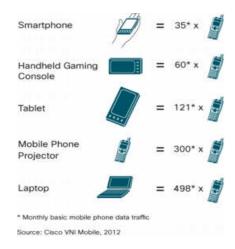
Furthermore, the uncertainty surrounding a novel assignment auction process has the potential to reduce bids in the initial forward auction. Other outcomes are possible, but adopting a quasi-random procedure of assignment at least has the benefit of eliminating one source of uncertainty in an auction already fraught with complexity. The process also focuses the entirety of carriers' budgets on spectrum clearing and may increase overall auction revenue and unleash more mobile broadband spectrum.

### D. The Commission Should Adopt and Apply a Cap on Spectrum Holdings Below 1 GHz to Determine Eligibility in the Forward Auction.

In designing the forward auction, the Commission should adopt eligibility rules that prevent the risk of excessive spectrum concentration in the hands of one or two carriers, promote long-term competition, and encourage participation among all interested parties. By making the 600 MHz band accessible to a wide range of licensees – including competitive providers of mobile wireless services that currently lack the spectrum resources under 1 GHz predominantly held by the nation's two largest operators – the Commission can encourage the development of new mobile technologies and services, ensure the efficient use of the 600 MHz band, enhance consumer welfare, and accelerate the deployment of advanced mobile services in more parts of the country.

## 1. <u>The Forward Auction Should Promote Spectrum Diversity and Avoid the Further Concentration of Spectrum Below 1 GHz.</u>

As the Commission has indicated, the wireless industry is experiencing a "transformation" in which consumers are increasingly migrating from voice services to data services. <sup>42</sup> According to the CTIA's semi-annual wireless industry survey this year, wireless data traffic more than doubled from July 2011 to June 2012<sup>43</sup> – a reflection of the country's "growing appetite for more mobile data and the wireless industry's need for more spectrum to meet their demands." <sup>44</sup> The rapid proliferation of smartphones, tablets, and laptops capable of operating on mobile networks has been a significant driver of mobile traffic. Cisco found that a single smartphone can generate as much traffic as thirty-five basic-feature handsets, while a laptop can generate the same amount of mobile traffic as 498 basic-feature phones. <sup>45</sup>



\_

<sup>&</sup>lt;sup>42</sup> Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12-269, *Notice of Proposed Rulemaking*, 27 FCC Rcd 11710, 11716 ¶ 11 (2012) ("*Spectrum Holdings NPRM*"); *see also* Comments of T-Mobile USA, Inc., Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12-269 (filed Nov. 28, 2012) ("*T-Mobile Spectrum Holdings Comments*").

<sup>&</sup>lt;sup>43</sup> See CTIA-The Wireless Association, Semi-Annual Wireless Industry Survey (Apr. 13, 2012), available at http://www.ctia.org/advocacy/research/index.cfm/AID/10316.

<sup>&</sup>lt;sup>44</sup> CTIA Press Release, *Consumer Data Traffic Increased 104 Percent According to CTIA-The Wireless Association Semi-Annual Survey* (Oct. 11, 2012), *available at* http://www.ctia.org/media/press/body.cfm/prid/2216.

<sup>&</sup>lt;sup>45</sup> Cisco Data Traffic Report at 8.

Although spectrum has always been essential to a carrier's ability to compete, the data-driven demand for bandwidth has amplified the need for commercial wireless operators to acquire adequate spectrum to provide competitive service and meet consumer expectations. As the Commission has noted, "[f]acilitating access by all providers to valuable spectrum resources . . . is essential given the current mobile landscape," and a carrier's ability to access spectrum "affect[s its] ability to compete effectively."

While consumer demand for data services has risen, the potential sources of spectrum suitable for those services are diminishing. Despite the Commission's efforts to implement policies and safeguards to promote widespread access to spectrum resources, spectrum best suited for advanced mobile broadband applications – particularly below 1 GHz, which is ideal for nationwide, wide-area regional and rural coverage with superior propagation characteristics – has become increasingly concentrated in the hands of the largest U.S. wireless carriers. As of the Commission's 2011 report analyzing the competitive market conditions for mobile wireless services, Verizon Wireless and AT&T held a large majority of this spectrum: 67.20% of 700 MHz commercial spectrum, and 91.30% of cellular (850 MHz) spectrum. These figures do not include any acquisitions since the end of 2010, including AT&T's purchase of significant 700

\_

<sup>&</sup>lt;sup>46</sup> Spectrum Holdings NPRM, 27 FCC Rcd at 11716 ¶ 12.

<sup>&</sup>lt;sup>47</sup> See Fifteenth Report, 26 FCC Rcd at 9830 ¶ 286.

<sup>&</sup>lt;sup>48</sup> Economist Scott Wallstein has analyzed data from every FCC spectrum auction since 1996 and confirmed that spectrum is "becoming increasingly scarce in a relative sense," as indicated in particular by how "spectrum prices [have] increased significantly from 2007-2011." Scott Wallsten, Technology Policy Institute, *Is There Really a Spectrum Crisis? Quantifying the Factors Affecting Spectrum License Value* at 1 (Jan. 23, 2013).

 $<sup>^{49}</sup>$  Fifteenth Report, 26 FCC Rcd at 9826-28  $\P\P$  280-282.

 $<sup>^{50}</sup>$  *Id.* ¶ 287 & Table 27.

MHz spectrum from Qualcomm.<sup>51</sup> Nor do they include the multi-billion dollar acquisitions of low-frequency 700 MHz and 850 MHz spectrum that AT&T announced this week.<sup>52</sup>

This concentration of low-band spectrum stifles competition by increasing the costs of carriers such as T-Mobile to provide the extensive network coverage that consumers demand. Moreover, this concentration is likely to continue in the future, particularly as the top two carriers enter into more "spectrum-only transactions" to augment their existing spectrum resources. <sup>53</sup> Concern about anti-competitive spectrum aggregation was one of the principal reasons why the Commission initiated a rulemaking to assess its spectrum holdings policies. <sup>54</sup> Accordingly, the

<sup>&</sup>lt;sup>51</sup> J.P. Morgan, Telecom Services and Towers 5 (Dec. 5, 2012) ("AT&T bought an additional 12 MHz of 70 [million] pops and 6 MHz of 230 [million] pops of 700 MHz spectrum from Qualcomm in 2011for \$1.925 [billion].").

<sup>&</sup>lt;sup>52</sup> On January 25, 2013, AT&T announced the acquisition of Verizon's lower 700 MHz B Block licenses for a combination of \$1.9 B in cash and other assets. The 700 MHz licenses to be acquired by AT&T cover 42 million people in 18 states – California, Colorado, Florida, Idaho, Illinois, Louisiana, Montana, New Mexico, New York, Ohio, Oklahoma, South Dakota, Tennessee, Texas, Utah, Virginia, Washington and Wyoming. *See* Darrell Etherington, *AT&T to Acquire 700 MHz Spectrum from Verizon for \$1.9B in Cash and AWS*, Tech Crunch (Jan. 25, 2013), <a href="http://techcrunch.com/2013/01/25/att-to-acquire-700-mhz-spectrum-from-verizon-for-1-9b-in-cash-and-aws-spectrum-licenses/">http://techcrunch.com/2013/01/25/att-to-acquire-700-mhz-spectrum-from-verizon-for-1-9b-in-cash-and-aws-spectrum-licenses/</a>. On January 22, 2013, AT&T announced the acquisition of Atlantic Tele-Network, Inc.'s ("ATNI") wireless assets for \$780 million. ATNI, the nation's tenth largest wireless carrier by subscribers, holds wireless licenses in the 700 MHz, 850 MHz and 1900 MHz bands. AT&T, *AT&T to Acquire Wireless Spectrum and Assets from Atlantic Tele-Network, Inc.*, (Jan. 22, 2013), <a href="http://www.att.com/gen/press-room?pid=23674&cdvn=news&newsarticleid=35955">http://www.att.com/gen/press-room?pid=23674&cdvn=news&newsarticleid=35955</a>.

<sup>&</sup>lt;sup>53</sup> Spectrum Holdings NPRM, 27 FCC Rcd at 11718 ¶ 14; See, e.g., ULS File Nos. 0005262760, 0005286787, 0005296026, 0005295740; Wireless Telecommunications Bureau Seeks Comment on Request for Waiver and Applications for Assignment of the Upper 700 MHz C Block License in the Gulf of Mexico from Small Ventures USA, LP to Cellco Partnership d/b/a Verizon Wireless, WT Docket No. 12-373, Public Notice, DA 12-2066 (rel. Dec. 21, 2012). Just last month, AT&T successfully increased its spectrum inventory by a substantial amount by acquiring Wireless Communications Service ("WCS") and Advanced Wireless Services ("AWS-1") licenses in 608 CMAs. See Applications of AT&T Mobility Spectrum LLC, New Cingular Wireless PCS, LLC, Comcast Corporation, Horizon Wi-Com, LLC, NextWave Wireless, Inc., and San Diego Gas & Electric Company for Consent to Assign and Transfer Licenses, WT Docket No. 12-240, Memorandum Opinion and Order, FCC 12-156 (rel. Dec. 18, 2012) ("AT&T WCS/AWS Order").

<sup>54</sup> See Spectrum Holdings NPRM, 27 FCC Rcd at 11716 ¶¶ 11-14.

Commission should adopt clear rules in this proceeding that prevent the further concentration of spectrum below 1 GHz.

2. The Commission Can Best Promote Competition, Spectrum Diversity, and Participation in the 600 MHz Forward Auction by Limiting the Amount of Spectrum Below 1 GHz a Licensee May Hold in a Single Market.

To promote long-term competition, encourage auction participation, and prevent the further consolidation of spectrum below 1 GHz, the Commission should adopt rules in this proceeding that prohibit any licensee from acquiring more than a certain percentage of spectrum below 1 GHz, applied on a market-by-market basis. <sup>55</sup> As T-Mobile has argued in other proceedings, the Commission should adopt a spectrum-based cap for auctions equal to one-third of the available commercial mobile spectrum below 1 GHz. <sup>56</sup> For example, as applied to the upcoming incentive auction, if 204 megahertz of commercial mobile spectrum below 1 GHz were available in a single market (including reallocated spectrum in the 600 MHz band), the Commission's rules should preclude any party from winning licenses in that market sufficient to cause it, following the auction, to hold more than sixty-eight megahertz of spectrum below 1 GHz in that market. Such a framework would provide interested parties with reasonable assurances that they can meaningfully compete for spectrum in a geographic area without the risk of only one or two of the largest carriers commandeering the entire market.

Adopting a rule designed to stem spectrum consolidation below 1 GHz is especially appropriate because such spectrum is uniquely valuable for mobile broadband applications. The

-

<sup>&</sup>lt;sup>55</sup> The Commission routinely evaluates a licensee's spectrum holdings "on both a local and national level."  $AT\&T\ WCS/AWS\ Order\ \P\ 33$ .

<sup>&</sup>lt;sup>56</sup> See generally T-Mobile Spectrum Holdings Comments; Reply Comments of T-Mobile USA, Inc., Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12-269 (filed Jan. 7, 2012) ("T-Mobile Spectrum Holdings Reply Comments"). As reflected with those filings, the Commission could design the spectrum cap this proceeding to reflect and respond to market conditions.

Commission has consistently recognized this fact, noting recently that "the more favorable propagation characteristics of lower frequency spectrum, *i.e.*, spectrum below 1 GHz, allow for better coverage across larger geographic areas and inside buildings,"<sup>57</sup> and that "there currently is significantly more spectrum above 1 GHz potentially available for mobile broadband services than spectrum below 1 GHz."<sup>58</sup> These distinctions have practical implications: Licensees of higher frequency spectrum with less ideal propagation characteristics must construct more cell sites in a given geographic area, at a significantly greater cost, to try to match the signal coverage of a licensee deploying service using 700 MHz, 850 MHz, and now 600 MHz, band spectrum. For this reason, it is "prudent to inquire about the potential impact of [a licensee's] aggregation of spectrum below 1 GHz" when evaluating a proposed spectrum transfer.<sup>59</sup> The Commission

\_\_

<sup>&</sup>lt;sup>57</sup> Spectrum Holdings NPRM, 27 FCC Rcd at 11725-26 ¶ 35 (citing Application of AT&T Inc. and Qualcomm Incorporated for Consent to Assign Licenses and Authorizations, WT Docket No. 11-18, Order, 26 FCC Rcd 17589, 17609-11 ¶ 49 ("AT&T-Qualcomm Order"); Service Rules for the 698-746, 747-762 and 777-792 MHz Band, WT Docket No. 06-150, Second Report and Order, 22 FCC Rcd 15289, 15349 ¶ 158, 15354-55 ¶ 176, 15400-01 ¶ 304 (2007); Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd 16807, 16820-21 ¶ 32 (2008); Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Second Memorandum Opinion and Order, 25 FCC Rcd 18661, 18662 ¶ 1 (2010)).

<sup>&</sup>lt;sup>58</sup> Spectrum Holdings NPRM, 27 FCC Rcd at 11725-26 ¶ 35 (citing AT&T-Qualcomm Order, 26 FCC Rcd at 17611 ¶ 49; Fifteenth Report, 26 FCC Rcd at 9836 ¶ 297). Likewise, Commissioner McDowell has noted that "spectrum is not fungible," and that 700 MHz frequencies are "particularly attractive for any type of wireless service" due to "their low spectral location, [allowing them to] travel much farther and have more building penetration power than higher frequencies such as the personal communications service (PCS) spectrum (at 1900 MHz), or even the original cellular spectrum (at 850 MHz)." Remarks of FCC Commissioner Robert M. McDowell, Catholic University School of Law Symposium (Mar. 15, 2007), available at http://hraunfoss.fcc.gov/edocs\_public/attachmatch/DOC-271555A1.pdf.

<sup>&</sup>lt;sup>59</sup> See AT&T-Qualcomm Order ¶ 49; see also Fifteenth Report, 26 FCC Rcd at 9841 ¶ 307. Spectrum is not a fungible commodity. Spectrum has unique properties that vary by frequency and a company derives material value from having a diversified portfolio of spectrum. Low frequency bands complement high frequency bands because low frequency bands offer greater geographic coverage and in-building penetration than high frequency bands. Low frequency spectrum is less commonly available and more highly valued than higher frequency spectrum. See, e.g. Wallsten, supra note 56 at 20 (indicating that, based on analysis of every spectrum

should, therefore, take measures to ensure that the spectrum made available in this auction – which is among the most valuable spectrum for mobile broadband services – is efficiently distributed to foster competition and spectrum access.

The Commission has a clear statutory basis for establishing spectrum-based eligibility rules in the 600 MHz forward auction. The Communications Act grants the Commission authority to establish eligibility criteria and bidding frameworks that promote "economic opportunity and competition . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants." The Spectrum Act likewise preserves the Commission's authority "to adopt and enforce rules . . . concerning spectrum aggregation that promote competition." Promoting competition is also one of the fundamental goals of the nation's mobile wireless policy, as prescribed by Congress. Moreover, applying a cap on spectrum holdings below 1 GHz would be consistent with Commission precedent and policies. As T-Mobile has previously explained, such a cap would apply to all potential bidders in the auction, and would therefore be of "general applicability." Likewise, the Commission has previously "implemented

911

auction since 1996, "spectrum below 1 GHz," when used for broadband, is "more valuable than spectrum above 1 GHz").

<sup>&</sup>lt;sup>60</sup> 47 U.S.C. § 309(j)(3)(B).

<sup>&</sup>lt;sup>61</sup> *Id.* ¶ 383 (*citing* Spectrum Act § 6404).

<sup>62</sup> See 47 U.S.C. § 332(a)(3), (c)(1)(C): Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; see also Fifteenth Report, 26 FCC Rcd at 9687 ¶ 3. To satisfy these statutory requirements, the Commission has sought comment in this proceeding on whether it should adopt "a rule that permits any single participant in the auction to acquire no more than one-third of all 600 MHz spectrum being auctioned in a given licensed area." NPRM ¶ 384.
63 T-Mobile Spectrum Holdings Comments at 11-12. As noted by Congressman Henry Waxman of the U.S. House of Representatives, Congress has directed the FCC "to continue to promote competition through its spectrum policies," and may do so by adopting a "spectrum cap... that applies either to all licensees or to spectrum offered in a particular auction, as long as such rules are not party-specific." See 158 Cong. Rec. E266 (daily ed. Feb. 28, 2012) (extension of remarks of Rep. Waxman) (further explaining that the Spectrum Act "preserves the FCC's ability to require, among other things, the divestiture of specific spectrum, such as spectrum below 1 GHz, in order to promote competition"); see also 158 Cong. Rec. E272 (daily ed. Feb. 28, 2012)

a variety of mobile spectrum aggregation policies and rules" to satisfy its statutory mandate of ensuring diversity of spectrum licensees and to promote a competitive, efficient, and innovative marketplace for wireless services.<sup>64</sup>

An explicit *ex ante* rule to prevent undue spectrum concentration in the valuable spectrum below 1 GHz is especially important for this 600 MHz auction, in which all participants will need to know the rules in advance to minimize the prospect of insincere bidding. Absent a spectrum-based eligibility rule, carriers may have an incentive to acquire more spectrum than they intend to use, if only to prevent disruptive competitors from securing the spectrum resources necessary to effectively compete. Establishing a pre-defined limit simplifies enforcement in the event excessive concentration does occur, and – importantly to the success of the incentive auction – keeps bidding during the auction sincere.

Even if after-the-fact remedies could require the carrier to eventually surrender some of its excess spectrum, the two largest carriers would still have an incentive to acquire more spectrum than needed. The post-auction remedy of re-running the incentive auction would be impractical and, under the plain language of the Spectrum Act, possibly unlawful. Moreover, the alternative post-auction remedy of mandatory divestiture would likely still allow the carrier to hand-pick the potential buyer or buyers that participate in the private spectrum sale. In either case, the carrier

(

(extension of remarks of Rep. Eshoo) (stating that preserving the FCC's ability to adopt and enforce rules of general applicability "is critical to ensuring that the FCC can meet its statutory obligation to ensure competition in the wireless marketplace by avoiding an excessive concentration of licenses through auction-specific rules"); Opening Statement of Rep. Henry A. Waxman, Ranking Member, Committee on Energy and Commerce, Hearing on "Keeping the New Broadband Spectrum Law on Track," Subcommittee on Communications and Technology (Dec. 12, 2012) ("As the steward of the public's airwaves, the FCC must have the authority to write auction rules that aim to avoid the concentration of spectrum in the hands of just a small group of companies."), available at

http://democrats.energycommerce.house.gov/sites/default/files/documents/Opening-Statement-Broadband-Spectrum-Law-2012-12-12.pdf.

<sup>&</sup>lt;sup>64</sup> Spectrum Holdings NPRM, 27 FCC Rcd at 11712  $\P$  4.

with excess spectrum below 1 GHz would be able to minimize competition, making its bidding rewarding, if not profitable, from the carrier's standpoint. A common understanding of the outer reaches of spectrum concentration at the outset of the auction would set the expectations for all parties, eliminate the need for complicated post-auction remedies, and minimize the risk of anticompetitive and inefficient bidding.

3. Adopting a Spectrum Cap in This Proceeding Is the Best Way to Address Concerns About Undue Spectrum Concentration Resulting From This Auction.

Adopting a cap on the amount of spectrum below 1 GHz that can be held in a market would have a number of benefits as compared with alternative means to remedy excessive spectrum concentration coming out of the auction. <sup>65</sup> First, in addition to avoiding further concentration of spectrum below 1 GHz, a bright-line spectrum cap would provide additional certainty for entities interested in acquiring the 600 MHz spectrum. <sup>66</sup> Because participating in a spectrum auction is a complex, time consuming, and expensive process, clear rules are essential to allow licensees to determine their eligibility to participate without the risk of facing a mandated post-auction spectrum divestiture. Such *ex ante* certainty would not only encourage broader participation in the auction, it would also facilitate the ability of prospective bidders to plan their networks, services, technologies, and business models, and secure the necessary financing.

Second, the proposed cap would reduce the administrative costs of assessing licensee spectrum holdings on a case-by-case basis after the auction.<sup>67</sup> Currently, to determine whether a licensee's acquisition of spectrum in secondary market transactions is in the public interest, the

31

<sup>&</sup>lt;sup>65</sup> See T-Mobile Spectrum Holdings Comments at 10-12.

<sup>&</sup>lt;sup>66</sup> Spectrum Holdings NPRM, 27 FCC Rcd at 11720 ¶ 20 (describing the Commission's goal of providing "greater certainty, clarity, and predictability regarding which licenses [interested parties] could acquire"); see also T-Mobile Spectrum Holdings Comments at 1.

<sup>&</sup>lt;sup>67</sup> See T-Mobile Spectrum Holdings Comments at 1.

Commission must assess a variety of factors, such as population density, the number of rival service providers, the rival firms' market shares, the population and land area coverage, and the availability of spectrum within the market for providers of mobile telephony and broadband services.<sup>68</sup> Ultimately, the Commission uses these factors to assess more subjective questions, such as the likelihood that "rival service providers or potential entrants would be foreclosed from expanding capacity, deploying mobile broadband technologies, or entering the market," and "whether rivals' costs would be increased to the extent that they would be less likely to be an effective competitive constraint."69 These considerations can be difficult and time-consuming to assess on a case-by-case basis even under the best of circumstances, but would be even more difficult to evaluate in this incentive auction proceeding where such questions could arise simultaneously in markets throughout the country and implicate multiple parties. This uncertainty – and the concomitant effect of reduced participation by both broadcasters and forward-auction bidders – risks delaying service deployment and thwarting the use of vital, "beachfront" spectrum. A cap on spectrum holdings below 1 GHz would avoid such complexity and the attendant public interest costs.

Third, a spectrum-based eligibility rule would eliminate the significant costs and inefficiencies of carrying out post-auction remedies. For example, even aside from assessing whether a licensee's acquisition of spectrum is permissible after the auction, the process of divesting that spectrum imposes substantial costs on the Commission, the licensee, and the public.

<sup>&</sup>lt;sup>68</sup> See AT&T WCS/AWS Order ¶ 34.

<sup>&</sup>lt;sup>69</sup> *Id.* (*citing* Applications of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC and Cox TMI, LLC for Consent to Assign AWS-1 Licenses, WT Docket No. 12-4, *Memorandum Opinion and Order and Declaratory Ruling*, 27 FCC Rcd 10698, 10725 ¶ 72 (2012); Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc. for Consent to Assign Licenses and Transfer Control of Licenses, MB Docket No. 10-56, *Memorandum Opinion and Order*, 26 FCC Rcd 4238, 4252 ¶ 34 (2011)).

Alternatively, unwinding the results of a completed auction with multiple bidders and re-running the auction to correct an excessive aggregation of spectrum is not only disruptive, but also delays the deployment of service, stifles competition, and yields undesirable spectrum policy.<sup>70</sup>

Fourth, a market-based spectrum cap would encourage auction participation, and potentially increase aggregate auction revenues by providing a clear signal to the marketplace that the nation's one or two largest providers will not be able to acquire all of the most valuable spectrum in a market. The subsequent increase in auction participation among the other carriers and new entrants could yield auction proceeds greater than what would be achieved without a spectrum cap. As noted spectrum auction design expert Peter Cramton testified before the United States Senate Budget Committee, in auctions where incumbent licensees have an advantage, "non-incumbents may be unwilling to participate... knowing that the incumbents will ultimately win." As a result, in auctions without a cap, "only incumbents show up, there is a lack of competition, and the incumbents split the licenses among themselves at low prices." By contrast, when a spectrum cap is in place, non-incumbent and smaller carriers recognize their increased likelihood of succeeding at auction, "giving them the incentive and ability to secure the needed financing from capital markets."

<sup>&</sup>lt;sup>70</sup> See Applications for Consent to the Transfer of Control of Licenses, XM Satellite Radio Holdings Inc., Transferor, to Sirius Satellite Radio Inc., Transferee, MB Docket No. 07-57, *Memorandum Opinion and Order and Report and Order*, 23 FCC Rcd 12348, 12452, Statement of Commissioner Deborah Taylor Tate (explaining that the divestiture of consolidated spectrum "is impractical, if not impossible, and would result in almost certain disruption of service to millions of subscribers").

<sup>&</sup>lt;sup>71</sup> See T-Mobile Spectrum Holdings Comments at 9.

<sup>&</sup>lt;sup>72</sup> Peter Cramton, *Lessons from the United States Spectrum Auctions*, Testimony before the United States Senate Budget Committee 3 (Feb. 10, 2000).

<sup>&</sup>lt;sup>73</sup> *Id*.

<sup>&</sup>lt;sup>74</sup> *Id*.

History bears this out. When the Commission imposed auction-specific caps on PCS spectrum, the bidding activity (adjusted for the number of licenses available) was similar to that in the auction of AWS-1 spectrum, in which no spectrum cap was imposed. Furthermore, the spectrum cap did not reduce the size of the bids for the PCS licenses (measured on a MHz-pop basis).

Finally, promoting spectrum diversity could yield long-term benefits, including government revenue, that far outweigh short-term revenue maximization. Obtaining value for the 600 MHz spectrum is just one of several goals that the Commission must pursue in this The Spectrum Act also directs the Commission to adopt and enforce proceeding. rules "concerning spectrum aggregation that promote competition" in the 600 MHz band. 75 As explained by one economist:

Focusing simply on revenue maximization is short-sighted. [Other mechanisms,] such as technical and service flexibility, and license aggregation and disaggregation, improve efficiency, and thereby improve revenues. But short-run revenue maximization by creating monopolies, which would create the highest profits before spectrum fees, and therefore would sustain the largest fees should be resisted. Indeed, competition, which ultimately will lead to greater innovation and better and more affordable services, will likely generate greater government revenues from a long-run perspective.<sup>76</sup>

Accordingly, "[t]he regulator may find it necessary to introduce spectrum caps or other preferences favoring new entrants so as to level the playing field between incumbents and new entrants," and incumbent providers place a value on "foreclosing competition, thus driving a wedge between social value and private value."77

<sup>77</sup> *Id.* at 2-3.

<sup>&</sup>lt;sup>75</sup> *NPRM* ¶ 383 (*citing* Spectrum Act § 6404).

<sup>&</sup>lt;sup>76</sup> Peter Cramton, Spectrum Auction Design 2-3 (2012), available at http://www.cramton.umd.edu/papers2005-2009/cramton-spectrum-auction-design.pdf.

The true measure of bidder valuation rests on the profit expectations of the bidders. Without market-based spectrum caps, the largest bidders would win additional spectrum and increase their market power. The resulting concentration – and the concomitant reduction of competitive checks on the largest providers – could prove costly to consumers who would face increased prices and decreased innovation. Because one of the objectives of the auction is to allocate the spectrum in a way that maximizes market efficiency, the Commission must take into account the post-auction consumer surplus that flows from a more competitive wireless broadband market. Smaller, disruptive providers provide competitive pressure in the industry and that pressure, in turn, improves the welfare of *all* consumers, not just the welfare of the customers of the smaller, disruptive providers. Therefore, the social benefit of allocating spectrum to smaller, more disruptive providers proves disproportionally high.

The Commission has repeatedly recognized the value of improving post-auction competition, and the 600 MHz spectrum auction should be no exception. Indeed, because the concentration of spectrum holdings below 1 GHz is much larger than in other bands, and because the strategic role of that spectrum for coverage, in-building penetration, and roaming is so much greater than in other bands, policies against spectrum concentration are particularly important in this auction.

#### IV. THE REVERSE AUCTION

To repurpose the optimum amount of broadcast spectrum for broadband use, the reverse auction must not only encourage widespread participation by broadcast incumbents, but also adopt a clearing rule that remains both broad enough to satisfy minimum closing conditions for revenue, and granular enough to ensure that broadcasters who wish to exit a given market may do so. The rationale behind expansive broadcaster participation is straightforward, even if the mechanics of achieving it are not: the more broadcast licensees that participate, the larger the pool of spectrum

available for broadband use. Achieving widespread participation will require the right mix of financial incentives to promote participation as well as careful attention to mechanisms that shorten and simplify the auction.

The rationale behind a carefully calibrated clearing rule may be less readily apparent, but a clearing rule is no less important than maximizing broadcaster participation. A nationwide clearing rule, which by definition would not be based on local and regional market conditions, may prevent willing sellers and buyers from entering economically sensible spectrum-clearing arrangements in particular markets. The Commission's clearing rule should take this possibility into account and consider a more granular approach that maximizes the availability of population-weighted spectrum for broadband use. Enhancing broadcaster participation and, if feasible, calibrating clearing rules to local or regional market conditions, has the potential to increase the amount of spectrum available for broadband use and lead to a more successful incentive auction.

## A. The Commission Should Encourage Widespread Broadcaster Participation, But Preclude Those With Expired or Incomplete Licenses from Seeking to Capture Auction Revenues.

The Commission should adopt rules that permit and encourage broad participation in the reverse auction among broadcast television licensees. The Commission has asked interested parties to comment on "how to design the incentive auction so as to facilitate the participation of a wide array of broadcasters and make it as easy as possible for them to submit successful bids." As noted in the *Notice*, full participation will further the goals of the Spectrum Act, maximize the amount of broadband spectrum made available through this proceeding, and empower all broadcast TV licensees – including those offering noncommercial educational programming – to "strengthen their financial positions and improve their service to the public."

<sup>&</sup>lt;sup>78</sup> NPRM ¶ 9.

<sup>&</sup>lt;sup>79</sup> *Id.* ¶ 76.

All full power and Class A broadcast licensees, commercial and non-commercial status alike, should be eligible to submit bids to relinquish all or part of their spectrum during the reverse auction. In addition, the Commission should allow the participation of any entity that held an original construction permit for a full power TV station as of February 22, 2012 (the date the Spectrum Act was enacted), if the entity obtains a license prior to the commencement of the auction process, as proposed in the *Notice*. 81

The Commission should also construe the Spectrum Act requirement that "at least two competing licensees participate in the reverse auction" to require at least two competing licensees across all markets to participate in the reverse auction. End Under this construction, the Commission would accept bids from a broadcast licensee even if there are no bids from another competing broadcast licensee in that market. While the ability to determine the amount of compensation owed to a broadcaster for voluntarily relinquishing its spectrum is essential, same-market competition is not essential for that purpose. The Commission can adequately assess the value of broadcast spectrum using objective, market-based data and comparable figures from neighboring and similar markets in the United States, even where there are no competing bids from licensees within the same market. A rule that would require at least two participating bidders in the reverse

<sup>&</sup>lt;sup>80</sup> *Id.* ¶ 76. The Commission should consider granting planning funding to broadcasters that evince an interest in the broadcast incentive auction. Licensees that establish a threshold of interest in participating in the auction should be eligible to receive post-auction funding for the frequency planning and engineering activity necessary to share stations or select site locations in support of arrangements to clear additional spectrum for broadband use. Planning funding has been a well-established feature of other spectrum relocations and particularly useful where, as here, the inventory and technical studies necessary to permit channel sharing may prove costly.

<sup>&</sup>lt;sup>81</sup> *Id.* ¶ 77.

<sup>&</sup>lt;sup>82</sup> *Id*.¶ 256.

<sup>&</sup>lt;sup>83</sup> *Id*.¶ 27 n.52; *id*. ¶ 256.

auction, which would run contrary to the Commission's objective of increasing broadcaster participation in the reverse auction.

Although robust broadcaster participation is critical to the success of the reverse auction, the Commission should nevertheless remain vigilant in identifying what spectrum usage rights a broadcast licensee may relinquish via the auction. Licensees with full power and Class A licenses that have expired or been revoked or cancelled should be ineligible to participate in the reverse auction because these licensees would have no spectrum usage rights to relinquish. Likewise, the Commission should consider bids to relinquish the spectrum usage rights that a broadcast licensee had only as of February 22, 2012 (the date the Spectrum Act was enacted). These eligibility limitations would preserve the coverage and population characteristics for each TV licensee as of the Spectrum Act's enactment date and create much-needed certainty in the planning stages of the reverse and forward auctions.

### B. The Reverse Auction Should Allow and Encourage Price Discovery by Broadcast Incumbents.

The *Notice* seeks comment on whether the Commission should conduct the reverse auction as a dynamic descending-clock auction or a single-round sealed-bid auction. <sup>86</sup> In a dynamic descending clock auction, high initial prices would attract many broadcast incumbents at the outset of the bidding. As the prices descend, some broadcasters would quit the auction. This process would continue until the supply of broadcast spectrum matches the demand for spectrum in the forward auction. By contrast, in a single-round sealed bid auction, broadcasters would submit a single bid for going off the air, and the Commission would review all available bids to develop the optimum mix of spectrum to clear.

<sup>85</sup> *Id.* ¶ 79.

<sup>&</sup>lt;sup>84</sup> *Id.* ¶ 78.

<sup>&</sup>lt;sup>86</sup> *Id.* ¶ 58.

Initially, it might appear that a single round sealed bid option would prove easier for bidders because they would not have to monitor an ongoing auction and make decisions each round. However, the Commission could create a dynamic auction that allows some bidders to use the option of a proxy bid that would be similar to the single-round, sealed-bid auction while allowing other bidders the chance to change strategies throughout the course of the auction as they learn more about the strategies and valuations of others.

This element of price discovery is one of the principal virtues of a dynamic auction. Unlike in a static auction, participants in the reverse and forward auctions will arrive at a transaction price in a given market by exchanging an immense quantity of information about spectrum valuations on a local, regional, and national level for stations with varying degrees of impairment, congestion, population density, and so on. This information exchange will generate considerable efficiencies for both buyers and sellers and offers a major advantage over static auctions.

That said, a dynamic auction would take longer and require more rounds to complete than a static auction. A dynamic auction would also require the Commission to make algorithm-based decisions about which stations to "freeze" at a given price, which could lead to inefficient auction outcomes compared to a single-round static auction where the Commission would retain some flexibility to optimize accepted bids to account for daisy chains of stations and other market-specific issues.

To reduce the duration of a dynamic reverse auction, the Commission should consider conducting the reverse auction with multiple spectrum-clearing targets in each phase instead of just one target.<sup>87</sup> The Commission could run the reverse auction with just one target, then run the

<sup>&</sup>lt;sup>87</sup> The spectrum-clearing target is the number of megahertz of spectrum the Commission seeks to clear during a phase of the reverse auction.

forward auction, and then, if the target was not met, restart the reverse auction for one less channel than the original clearing target. While conducting the alternating format with just one target would accelerate each reverse auction phase, this format would come at the price of increasing the likelihood of multiple, potentially time-consuming re-starts of the reverse auction. In addition, this approach would make it more difficult differentially to reduce the target clearing in different markets. By comparison, using multiple spectrum targets might extend the dynamic reverse auction phases somewhat, but would decrease the likelihood of multiple reverse auction re-starts. On balance, the somewhat longer phases that might be associated with multiple spectrum targets will likely have a shorter running time than having shorter rounds with multiple reverse auction restarts.

Whether the Commission pursues a dynamic or static auction or some hybrid of the two, the Commission should not pursue a single-round, sealed-bid auction format with a pay-as-bid pricing. <sup>89</sup> While a single-round, sealed-bid format with pay-as-bid pricing would prove easier and faster to administer than alternating auctions would, the single-round, sealed-bid format seems likely to harm both spectrum sellers and buyers. Under a single-round, sealed-bid format with pay-as-bid pricing, spectrum incumbents do not have an opportunity to gain any sense of the price at which other broadcasters are willing to offer their spectrum before the process is complete. Nor can the incumbents develop information about the price broadband providers might actually prove

\_

such as a second price rule or Vickrey pricing, can better encourage truthful bidding.

Another mechanism to balance simplicity with price discovery might be a hybrid static-dynamic approach where there are multiple phases of reverse and forward auction rounds, but sealed bidding for each phase of the reverse auction. Under this hybrid approach, broadcasters would submit only a single bid or set of bids for each phase of the reverse auction, but would retain the opportunity to revise their bids in subsequent phases, depending on the information they learned from the results of the previous reverse auction phase and the bids in the forward auction.

89 "Pay-as-bid pricing" means that a bidder would receive the amount of its bid. As a result, bidders do not generally have an incentive to truthfully reveal their valuations. Other mechanisms,

willing to pay for the spectrum. The incumbents simply have to guess what their stations are worth to wireless operators and, if they guess correctly, they are paid exactly what they bid, and nothing more. For example, a broadcast incumbent might ideally want \$100 million to return its spectrum, but would also readily accept \$90 million. A single-round sealed bid format with a payas-bid format requires the broadcast incumbent to guess with some degree of precision what the forward auction bidders will pay for the broadcast license. 90 If the incumbent accurately predicts the vagaries of wireless spectrum pricing, no one is worse off. If the incumbent guesses incorrectly that the market will support a \$100 million asking price, however, the incumbent loses the opportunity to return its spectrum at any price between \$90,000,000 and \$99,999,999.91 Because the single-round, sealed-bid format with pay-as-bid pricing robs the spectrum incumbents of second chances, the format seems ill suited to the goals of the incentive auction. Incumbent sellers are likely to become frustrated that they guessed demand incorrectly, and prospective buyers are likely to become frustrated that the incentive auction produced too little spectrum to support burgeoning wireless broadband demand. Encouraging price discovery through a dynamic descending-clock auction or a hybrid dynamic-static approach will make the auction more successful.

<sup>&</sup>lt;sup>90</sup> Determining a spectrum value is hardly an exact science. Relevant factors will include not only the net present value of the broadcast license and its associated operations, but also the anticipated price forward-auction participants may offer. Forward-auction prices can vary wildly and will depend on a variety of factors, including the auction format, the degree of market concentration, the anticipated revenue per user over the life of the license, the anticipated costs of deploying infrastructure, the anticipated costs of deploying user equipment, anticipated scale economies, strategic behavior among other bidders, and many other factors.

<sup>&</sup>lt;sup>91</sup> This lost opportunity might sting even more if the incumbent subsequently learns that a similarly situated licensee had its sell price of \$95 million accepted during the auction.

## C. Alternating the Reverse and Forward Auctions Will Promote Price Discovery and Accelerate the Auction Process.

To promote price discovery, the Commission should conduct the reverse and forward auctions in an alternating fashion. The Commission should run the reverse auction to discover prices for two or three target quantities of broadband spectrum and then run the forward auction to determine whether the clearing rule can be satisfied with the highest of the target spectrum quantities. If bids in the forward auction cannot satisfy the highest spectrum-clearing target, the Commission should continue running the forward auction and reduce the spectrum-clearing target only gradually and only in some areas based on the information developed from alternating auctions.

Alternating the reverse and forward auctions in this manner offers a timely mechanism to develop important data about the prices the broadcast spectrum can command and the prices broadband providers are willing to pay. While the information would necessarily remain incomplete, incipient supply and demand curves for spectrum in each market would allow the Commission to exercise greater precision in matching forward auction bids to spectrum-clearing targets on a market-by-market basis. The format would also provide some opportunity to accelerate the bidding process compared to other models: if the spectrum-clearing target in the alternating format proved accurate, the Commission would not be obliged to continue the reverse auction until it discovered the prices of all the smaller targets possible in every geographic unit. 92

<sup>&</sup>lt;sup>92</sup> Under T-Mobile's recommended approach, the Commission would begin the incentive auction by trying to determine the cost associated with clearing a range of channels at the highest end of expected clearing outcomes. If the first stage of the reverse auction set a clearing target of between twenty-one and sixteen broadcast channels, for example, the Commission would run the reverse auction stage to identify how much revenue would be required to clear those amounts of spectrum. The Commission would then conduct a forward auction stage with a supply of broadband licenses commensurate with the highest number of broadcast channels among the range of clearing targets considered, which, in this example, would be twenty-one cleared channels. If the revenue in the forward auction were insufficient to satisfy the clearing rule the Commission

The alternating approach would have many advantages. Rather than lower spectrumclearing targets or lower auction bids for broadcast spectrum in all areas all at once, information gleaned from the alternating forward and reverse auctions would allow the Commission to reduce the target quantity of cleared spectrum only in those areas where, for example, the population density is low. Similar to a simultaneous auction, the alternating approach provides important feedback information to auction participants. A simultaneous auction has the great benefit of allowing sellers and buyers to see supply and demand develop while they are deciding on whether to bid high, low, or not at all. At the same time, however, simultaneous reverse and forward auctions would require the identification and analysis of a very large number of possible spectrumclearing targets and forward-auction prices and, to be of any practical value, require that information be processed at a very rapid pace. While feedback about prices and spectrum-clearing targets would be available in theory, the sheer quantity of information available, and the necessarily limited time available to process that information, would likely impair informed decision-making by buyers and sellers alike. By allowing for a more manageable quantity of instant pricing feedback, the alternating format captures many of the price discovery benefits of simultaneous bidding while placing far fewer information processing demands on the Commission and the auction participants.

Assuming the Commission adopts an alternating format with a multi-round clock process, it should also permit intra-round bidding, in which bidders can indicate their changes in demand

\_

established, then the Commission would gradually reduce the supply of broadband licenses available and then continue the forward auction without restarting the reverse auction. Only if the bids in the forward auction failed to provide enough revenue to pay for clearing even sixteen channels – the minimum amount of the initial reverse-auction range in this example – would the Commission need to determine the costs to clear a range of twelve to sixteen broadcast channels in each area. If the Commission were forced to retreat to this lower spectrum-clearing target, it would then restart the forward auction again and see whether bids were sufficient to satisfy the closing rule starting with sixteen channels and working down to twelve channels.

by specifying new prices between the opening and closing prices of each round. As explained in the *Notice*, rising prices between rounds of a clock auction increases the risk of demand falling short of supply. Intra-round bidding can reduce this risk by affording bidders greater flexibility to respond to price changes. Moreover, intra-round bidding could allow the Commission to use larger bid increments and reduce the number of bidding rounds. This feature would "permit the auction to be completed in a fraction of the time required by a traditional SMR auction, with no loss of efficiency or added difficulty for bidders" of permit the successful of the

# D. Optimum Bid Collection Procedures Must Balance Competing Considerations of Incentives, Responsiveness, Simplicity, Duration and Complexity.

A handful of basic principles should animate whatever the specific auction procedures the Commission adopts. These principles are as follows: (1) promote threshold pricing; (2) reward broadcast participation; (3) use auction processes to develop information efficiently; and (4) avoid excessive complexity. These considerations are discussed further below.

#### 1. <u>Promote Threshold Pricing.</u>

To spur truthful bidding, increase the participation of broadcasters in the reverse auction, and ensure that the reallocated spectrum licenses are ultimately held by the parties that value them the most, the Commission should use Vickrey Pricing (or "threshold" pricing, as referred to in the *Notice*) to determine the amount paid to winning broadcasters that relinquish their spectrum

<sup>94</sup> *Id* 

 $<sup>^{93}</sup>$  NPRM ¶ 60.

<sup>&</sup>lt;sup>95</sup> See Appendix C at 4-5 (explaining that compared to an SMR auction, an ascending clock auction compresses several bidding rounds into one because bids are for generic licenses in a geographic area rather than specific frequencies, and intra-round bidding allows for greater increases in price from round-to-round because bidders are permitted to make bids during a round at fractional increments).

rights.<sup>96</sup> Under this framework, all winning broadcasters in a market would receive the amount equal to what they could have bid and still had their bids accepted in the reverse auction.<sup>97</sup> For example, assuming all stations have the same coverage area, if the Commission seeks to relocate five broadcast stations in a market, each of the five winning stations would receive a uniform payment amount equal to the *sixth*-highest bid submitted in that market, regardless of the bid amount that each of the five stations actually bid.<sup>98</sup>

Vickrey Pricing "provides ideal incentives for truthful bidding," as each broadcaster would be paid "the social opportunity cost of its winnings, and therefore receive[] 100 percent of the incremental value created by its bids." Because the seller's own bid would have no bearing on the payment received, the seller would have no incentive to demand more than they are willing to accept, which makes sales more likely to occur. As a result (and as explained in the *Notice*), a threshold pricing framework would give each broadcaster "an incentive to bid its station's value regardless of the bids submitted by others," resulting in a more truthful revelation of the minimum value at which broadcasters would exit a market (or agree to channel sharing). <sup>101</sup>

By contrast, a bid-pricing model in which a winning broadcaster would receive the actual amount it bid would produce complicated bid strategies and could be inefficient. <sup>102</sup> In that case, a broadcaster's bid would directly affect the proceeds it receives at auction. As a result, it would

<sup>&</sup>lt;sup>96</sup> Cramton, supra note 84, at 12 (noting that an auction "pricing rule plays a major role in fostering incentives for truthful bidding").

<sup>&</sup>lt;sup>97</sup> See Thomas Hazlett et al., Arlington Economics, *Incentive Auctions: Economic & Strategic Issues* 9-10 ("Arlington Economics White Paper").

<sup>&</sup>lt;sup>98</sup> *Id.* at 10.

<sup>&</sup>lt;sup>99</sup> *Id*.

<sup>&</sup>lt;sup>100</sup> Lawrence M. Ausubel & Paul Milgrom, *The Lovely but Lonely Vickrey Auction* 2 ("Ausubel & Milgrom"), available at

 $http://www.stanford.edu/\sim milgrom/publishedarticles/Lovely\% 20 but\% 20 Lonely\% 20 Vickrey\% 20 Auction-072404 a.pdf.$ 

 $<sup>^{101}</sup>$  NPRM ¶ 51.

<sup>&</sup>lt;sup>102</sup> Cramton, supra note 84, at 12.

have a strong incentive to "shade" its bid (i.e., bid more than its true value) or spend additional resources trying to learn about its competitors' values and/or auction strategies. "Such spending is pure waste from a social perspective, since it is not needed to identify the efficient allocation, yet it can be encouraged by auction formats in which each bidder's best strategy depends on its opponents' likely actions." Threshold pricing rules would effectively remove this incentive.

In a dynamic auction, the desire for "truthful" bidding has two implications. First, the Commission's opening bids for broadcast spectrum should be generous except in those areas where insufficient competition among broadcasters for the right to exit the band will exist. Prices in the reverse auction can fall, but they cannot increase. If the auction sets opening prices lower than the broadcaster's subjective value of the license, broadcasters will not participate. Suppressing participation is undesirable because less participation will generally mean less spectrum available for broadband use and an unsuccessful auction. At the same time, however, if insufficient competition among broadcasters exists, setting high initial prices would risk unnecessarily increasing the amount of compensation necessary to compensate the participating broadcasters. Indeed, offering a high price for a single license or even a group of licenses in a given market without a sufficient number of broadcasters competing for the right to receive payment might mean little or no pressure to drive the price down in that particular market below the generous initial price. While the need to encourage participation likely militates in favor of establishing generous opening bids, adopting mechanisms that can separate low-competition from high-competition markets prior to the auction could mitigate the risk of exceptionally large overpayments, while preserving the incentive for widespread participation. One mechanism to balance both goals without trying to perform the difficult exercise of fine-tuning the starting prices

<sup>&</sup>lt;sup>103</sup> Ausubel & Milgrom at 6.

too much is to open bidding with more than one bid in each market. For example, the Commission might establish three opening bids for each market, such as 50, 100 and 150 from some baseline. If enough bidders prove willing to relocate at 100, but not at 50, then the clock would start at 100. This multi-bid structure incorporates a sealed bid aspect to the opening prices and represents something of a hybrid of a sealed bid and a descending clock auction that affords some leeway for variable pricing in different areas and reduces the risk of extraordinary overpayment. 104

Second, the Commission's rules should minimize any incentive for a broadcaster to bid more than the broadcaster would actually accept to surrender the license. Mechanisms that try to squeeze every last dollar out of the broadcasters' bids could encourage broadcasters to inflate their bids to unrealistic heights. For example, two incumbents might have values of fifty and seventy to stay in the broadcasting business. In this situation, in a second price sealed-bid auction or descending clock auction, the broadcaster with the lower value of fifty would be the licensee to exit broadcasting because when the clock went below seventy, the other broadcaster would say that it would not relinquish its license since it would receive less than its true value. In a first-price sealed bid auction, however, if each broadcast incumbent believed the other had a value of eighty, they would both submit bids of seventy-nine. The price would be higher, but the Commission would have no assurance that broadcaster with the actual lower value of fifty would exit the band. As shown in this simple example, both the values and *perceptions* of other bidders'

<sup>&</sup>lt;sup>104</sup> Regardless of how initial prices are established, multi-station owners create a risk for price-setting that could thwart the goals of the incentive auction. Absent some type of prophylactic rule or structure, licensees of multiple stations could exercise market power through strategic supply reduction. The Commission should consider incorporating some mechanisms to make such price manipulation harder for any broadcast licensee that controls multiple stations in a market. For example, limiting information about how many stations still need to exit the auction to stop prices from decreasing may help.

values matter in a pay-as-bid auction. This phenomenon creates additional inefficiencies that threshold pricing avoids. Thus, while auction rules that promote "truthful" bidding could result in payments to broadcasters in excess of the irreducible minimum necessary for the broadcaster to exit the band, overpayment in some cases could be better in expected value because of the additional participation it engenders in other cases.

In sum, setting the "right" initial, or Round 0, price for any given broadcast station is essential. Whether the Commission pursues a dynamic or static reverse auction, the bidding structure should incorporate mechanisms that establish strong incentives for truthful bids while at the same time have enough flexibility to identify and accommodate low-competition markets where exceptionally high opening prices might never come under any competitive pressure.

#### 2. Reward Broadcast Participation.

Broadcasters should benefit from the transitioning of their spectrum to higher-valued uses. The Notice recognizes that, for purposes of both fairness and practicality, the Commission must tailor the Round 0 prices according to some formula. 105 The current suggestion for the formula is to compute prices based on the number of people covered by a given station. While some measure of population covered represents a solid foundation for establishing Round 0 prices, the Round 0 prices should also incorporate other objective factors, including potentially the relative expected value of the spectrum used for wireless service.

Incorporating the relative expected value of the broadcast spectrum if it were used for wireless broadband service into the Round 0 price is both forward-looking and value-enhancing. Broadcast licensees operate under various statutory and administrative regulatory constraints that limit their flexibility to pursue the highest-value uses in exchange for performing numerous public interest obligations. CMRS licensees operate under fewer statutory and administrative constraints

 $<sup>^{105}</sup>$  NPRM ¶ 42.

and are more readily able to put their spectrum to the highest valued use. Using broadband values rather than broadcast values in establishing Round 0 prices would account for the discrepancy between a constrained set of uses under the broadcast regime and the more flexible set of uses allowed under the CMRS rules and, perhaps more importantly, allow broadcasters to share in the reward of putting spectrum into the more flexible, value-enhancing regime. Incorporating prices from prior CMRS auctions into the Round 0 price formula would likely lead to Round 0 prices that are higher in the MEAs with the largest populations, highest-density of subscribers, and most favorable business environments. However, to eliminate possible idiosyncratic bidding that may have occurred in individual auctions in the past, the formula should use *relative* values from a variety of prior auctions to establish Round 0 prices across the country for similar amounts of spectrum, rather than any one auction price.

#### 3. <u>Use Auction Processes to Develop Information Efficiently.</u>

The Commission's Round 0 prices should also examine whether and how to respond to impaired areas, especially those near the Canadian and Mexican borders. An objective analysis of the degree of impairment in a given market might lead to a higher Round 0 price than a strict application of population covered and relative broadband pricing might ordinarily suggest. If, for instance, clearing a low-population, low-value station in Maine proves critical to allowing a high-population, high-value station in New York to exit the band due to the "daisy-chain" interference effect of multiple stations in close proximity to one another, the auction may benefit from establishing a higher price for the Maine station than might otherwise be warranted if considering only the population covered and relative spectrum values.

<sup>&</sup>lt;sup>106</sup> *Id.* ¶¶ 151, 172 (defining impaired regions as "[w]ireless license areas in which less than the targeted amount of spectrum can be cleared at the reserve prices").

Establishing Round 0 prices, and especially trying to calibrate those prices for impaired areas, will prove challenging without some amount of information gathering by the Commission concerning the willingness of broadcasters to part with their spectrum and the demand by broadband providers to acquire spectrum in any given market. The Commission need not and – as a practical matter – probably could not conduct a pre-auction inquiry of all broadcast licensees in impaired areas prior to the auction. The information would not necessarily be reliable or remain accurate.

Rather than engage in a heavy-handed information gathering process, the Commission might consider modifying the reverse auction process to naturally generate additional information for the auction administrator. Specifically, the Commission could design the reverse auction in a manner that allows it to discover two to three price points for each area that correspond to two or three targeted amounts of spectrum to be available. The Commission might generate this information either by establishing multiple Round 0 prices for different clearing targets, or by increasing the Round 0 price in impaired areas to the point at which the Commission could create additional paired licenses in that area.

Either approach would require a more comprehensive design solution for the reverse auction, but would allow the Commission to learn how much prices would need to be increased to create sufficient spectrum for auction. For example, the Commission could try to determine the bids needed to create three options in a market, such as (a) seven paired licenses, (b) six paired licenses, and (c) five paired licenses. In seeking price information across all three scenarios, the Commission might learn that the financial difference between creating seven paired licenses and six paired licenses is, in relative terms, quite small and readily attainable.

Under those circumstances, the Commission might slightly elevate the Round 0 prices for all stations in the market to secure a more generous amount of spectrum for broadband use. If the Commission's initial target was limited only to understanding the cost of procuring seven paired broadband channels, however, the Commission would never know that, for a relatively small sum, it could have realized more value for the wireless industry, consumers, and taxpayers. Thus, while developing information across a range of spectrum clearing scenarios might not be strictly *necessary* to the success of the auction, understanding the elasticity of supply and demand would likely prove helpful in identifying and achieving additional efficiency-enhancing transfers of spectrum.

### 4. <u>Avoid Excessive Complexity.</u>

One powerful counterweight to all of the possible efficiency-enhancing elements of an auction is complexity. In the situations discussed above, the benefit of the proposed options would likely outweigh the relatively small incremental increase in complexity. Other efficiency-enhancing options the Commission has proposed in its *Notice* may not prove as beneficial, however. For example, the Commission proposes to allow multiple paths for television stations to exit the spectrum band. These options are (1) quitting broadcasting, (2) sharing a channel, or (3) moving from the UHF to the VHF band. The Commission has also sought comment on other, even less definitive options, including (4) accepting additional interference, (5) accepting reduced coverage, and (6) accepting different antenna patterns. The commission has also sought comment on the coverage, and (6) accepting different antenna patterns.

Conceptually, any additional flexibility would prove beneficial to both broadcasters and broadband providers. Broadcasters would have the ability to minimize the cost of, and maximize the benefits from participating in the incentive auction, and broadband providers would benefit from the increased spectrum available.

 $<sup>^{107}</sup>$  Id.  $\P$  84.

 $<sup>^{108}</sup>$  Id. ¶¶ 87-88.

While flexibility could yield some benefits, the injection of additional complexity into the auction would also create new challenges. The core options of quitting broadcasting, sharing a channel, or moving from the UHF to the VHF band may pose complicated business questions for the broadcasters, but these options have the benefit of being relatively straightforward, largely binary choices that, whatever the complications for the broadcaster, pose no special challenges for the Commission as auction administrator. By comparison, the other options of accepting additional interference, reducing coverage, or adopting alternative antenna patterns in exchange for compensation are subjective, will vary by station and geography, and do not lend themselves to a formulaic or simple administrative rule. If a broadcaster is willing to surrender a portion of its coverage area, for example, the Commission must know not only how much of the area will be surrendered, but also the population covered, its precise geographic boundaries, and the relation of that area and channel to other stations in the band at various different clearing targets and price points. The Commission must then take all of this information into account in determining whether to accept a broadcast licensee's proffer, reject the proposal, or potentially propose an alternative – all within the context of a time-sensitive auction environment. efficiency-enhancing features of the additional options, therefore, the non-binary choices could significantly increase the complexity of the Commission's optimization problem.

### E. The Reverse Auction Process Should Seek to Maximize the Availability of Population-Weighted Spectrum.

During the reverse auction, the Commission presumably will establish a clearing target and assess whether sufficient demand exists in the forward auction to pay broadcasters to clear the band. In the *Notice*, the Commission appears inclined to establish a minimum number of paired spectrum blocks across the United States (other than certain pre-defined "impaired" areas near the

international borders). 109 If the aggregate total of the forward auction bids were to prove insufficient to cover the costs of clearing established by the Commission, then the Commission would incrementally reduce its spectrum-clearing target to a progressively smaller number of paired spectrum blocks until the supply of cleared spectrum matched the demand found in the forward auction. While this strategy sensibly ties supply to demand, a nationwide adjustment of the clearing target risks overlooking markets – perhaps high-value, high-population density markets - where forward-auction demand would, in fact, exceed the cost of acquiring or clearing the spectrum in that particular market, even if nationwide demand would not. Rather than jump to a lower level of paired blocks if some areas do not have enough spectrum, the Commission would clear more spectrum by setting benchmarks for how much additional impairment would be allowed before it moved to a lower level of paired spectrum. For example, if an encumbrance affected only a relatively small, unpopulated boundary area of a larger MEA, the encumbrance might not matter to the prospective broadband licensees in that market. In such a case, broadcasters, broadband providers, and taxpayers would be better off if the Commission retained a higher channel pair clearing target and disregarded the minor encumbrance at the boundary.

The Commission, therefore, may want to consider adopting some pre-determined, prepublicized rule that assesses the severity of an encumbrance in the geographic area and indicates that minor encumbrances will be disregarded in setting the spectrum-clearing target. To illustrate, the benchmark may be that if 75% of the population can be covered by paired blocks, the target level would not be reduced, even if some of the channels could not be cleared in the market. Another metric might be if 75% of the weighted population were to be covered, using the initial Round 0 weights to reflect the differential value of spectrum in different areas, the target level

<sup>109</sup> *Id.* ¶ 182.

would not be reduced. This type of flexibility would prevent a small degree of broadcast overlap from preventing a high level of market clearing without prejudicing the incumbent broadcaster or prospective bidders.

An alternative means of achieving a similar result would be to selectively reduce the channel clearings by market. Under this approach, the Commission would gradually reduce the target level in a market – not nationwide – to maximize the amount of spectrum moved to higher-value usage. Specifically, if the *national* clearing rule were not satisfied, the target would be reduced by one block at a time in selected areas to determine whether the auction could be closed without reducing the target nationwide. For example, if the current clearing target created ten paired licenses and one unpaired license nationwide, the Commission would not reduce the clearing target nationally, but rather reduce the clearing target from ten to nine in one MEA, and then a second, and so on until either the clearing rule is satisfied or the target is reduced nationwide.

Although this approach has many benefits, it poses at least three challenges in implementation. First, the order in which the Commission chooses MEAs would affect the result; therefore, the Commission would have to carefully choose the order in which it adjusts MEAspecific channel clearing targets. One possible way to simplify and objectify the order choice would be to examine the MEAs in which the gap between the price offered for a license and the price needed to acquire spectrum is the largest because that area would be contributing the most to the gap in the clearing rule. Another mechanism to accomplish the same result would be to express the gap between the clearing target and the available spectrum in spectrum per person in the area. If the gap were 20% in low-population areas and 2% in a high-population MEA, it

would be cheaper to reduce the target in a few MEAs with low population than in one MEA with a high population. 110

Second, ideally the Commission would want to administer the reverse auction in a manner that allows it to obtain price information for at least two spectrum-clearing targets in each MEA, as suggested above. If the value per megahertz of paired licenses were drastically higher than of unpaired licenses, reducing the target from eight paired to seven paired and one unpaired might prove insufficient. As a result, identifying price points for multiple spectrum-clearing alternatives, such as eight paired blocks, seven paired and one unpaired block, and seven paired blocks would help the Commission determine the most administratively efficient and cost-effective path to spectrum clearing.

Third, due to the imperfect overlap between broadcasting licenses and wireless service licenses, it may not be possible to run the auction as smoothly as described. For example, since some broadcasters span more than one wireless geographic area, reducing spectrum-clearing targets in one geographic area at a time may be impossible unless those geographic areas are licensed by MEA, as T-Mobile has recommended. While MEAs will still face some of the same conflicting boundary issues as EAs, the use of smaller geographic areas necessarily would involve more border considerations and overlaps by broadcasters, which would complicate or possibly preclude a more granular and efficient reduction in spectrum clearing targets.

 $<sup>^{110}</sup>$  Of course such calculations are complicated by the fact that the MEAs and broadcasting areas differ.

<sup>&</sup>lt;sup>111</sup> See supra Section II.D.

## F. In Responding to an Unsatisfied Clearing Rule, the Commission Should Adopt Auction-Design Choices that Maximize the Amount of Spectrum Available for Wireless Broadband.

If forward auction revenues do not cover the reverse auction costs, the Commission should adopt clearing-rule satisfaction policies that maximize the amount of spectrum cleared and made available for broadband deployment. The Commission can respond to an unsatisfied clearing rule in one of two basic ways: it can either try to coax additional money from the forward auction participants or it can selectively reduce the spectrum-clearing targets. The method or, more accurately, the combination of methods, the Commission ultimately selects will have important consequences for the outcome of the incentive auction. Coaxing higher bids from the forward-auction participants will make more spectrum available for broadband than will setting lower spectrum-clearing targets. Therefore, the Commission's first response to an unsatisfied clearing rule should always be to encourage higher bidding. Only if higher bidding does not occur should the Commission reduce the clearing target.

One mechanism to close a shortfall between the bid total and the spectrum-clearing target is to simply ask the forward-auction participants whether they are willing to cover the shortfall. Just as a traditional auctioneer uses the phrase "Going once, going twice . . ." to encourage last-minute bidding activity on an item, the Commission could use a request for additional payment to bridge the gap between the total cumulative bidding amounts and the amount necessary to clear the desired spectrum target. Specifically, if the clearing target were not met, the Commission would ask all bidders that are provisionally winning bidders at the end of the forward auction whether they would be willing to pay some lump-sum amount to cover the shortfall between the bid total and amount necessary to reach the spectrum-clearing target. The Commission would compute the lump-sum payment required to end the auction at the higher spectrum-clearing target

in some proportion to the amount of spectrum that a bidder is provisionally winning.<sup>112</sup> If the bidders' collective value of the licenses were sufficiently above the sum of prices they would need to pay, the bidders would likely prefer paying their share of the lump-sum payment over having the target reduced and facing presumably higher prices for this reduced pool. If the bidders failed to meet the shortfall, however, the Commission would reduce the spectrum-clearing target and restart the auction.

Suppose, for example, there were ten bidders in the forward auction, each of which would receive some number of fifty-five licenses available for auction if the closing rule were satisfied. One bidder would win one license. Another would win two. A third would win three and so on up to the tenth bidder who would win ten licenses. Each bidder bid for equal sized licenses at \$1,000 per license, resulting in a total bid amount of \$55,000. However, if the amount necessary for the clearing rule to be satisfied were \$66,000, the bidders might be willing to increase their bids from \$55,000 to \$66,000 rather than to face a reduced supply of licenses. After all, the bidders in this example presumably stopped increasing their bids because the next highest bidder(s) dropped out, not because \$1,000 was the most they would be willing to pay. If the difference of \$11,000 were to be allocated proportionately among the bidders, the bidder winning 10 licenses would be asked if she were willing to pay an additional \$2,000, the next bidder an additional \$1,800, the third, \$1,600 and so on down to the bidder with a single \$1,000 license being asked to pay an additional \$200. If all of the bidders agreed to increase their bids, the gap would be closed and the auction would close. If not, then the Commission would reduce the supply of licenses (and either restart the reverse auction or, if the prices for the reduced supply were already known from the reverse auction, restart the forward auction with a reduced supply).

<sup>&</sup>lt;sup>112</sup> The Commission could use the final clock-round prices to determine the relative weights among bidders' respective shares of the lump sum payment.

Although this voluntary, gap-filling measure would not eliminate the free-rider problem, the process might alleviate it somewhat and allow bidders to express a willingness to pay more without automatic reduction of the number of licenses. This approach would also increase the likelihood that the incentive auction clears the maximum amount of spectrum possible.

By allowing additional opportunities for more revenue to clear more spectrum, gap-filling measures can benefit all parties. Rather than enumerate all of the possible variations of gap-filling measures here, it is enough to say that the Commission should choose those options that increase opportunities to maximize the amount of spectrum transitioned from broadcasting to wireless broadband use.

### G. Conducting At Least Two Mock Auctions Will Assist Spectrum Sellers and Spectrum Buyers Navigate the Auction Process.

The Commission has indicated its intent to conduct a mock auction before starting the reverse and forward auctions after broadcasters and interested bidders submit their applications to participate in the auctions. However, in light of the substantial complexity of this auction, the Commission should take additional measures to ensure that all interested parties (including the Commission itself) understand the mechanics and nature of the reverse and forward auction processes. A single mock auction is likely to be inadequate for this purpose.

Accordingly, the Commission should conduct at least two mock auctions, one of which should occur prior to accepting any applications from reverse and forward auction participants. Doing so would yield several benefits. First, conducting at least two mock auctions would "allow qualified bidders to familiarize themselves with the FCC Auction System" and inquire about the

<sup>&</sup>lt;sup>113</sup> See Federal Communications Commission, Learn Everything About Reverse-Auctions Now (LEARN), at <a href="http://www.fcc.gov/learnprogram">http://www.fcc.gov/learnprogram</a>.

<sup>&</sup>lt;sup>114</sup> NPRM ¶ 4.

system and auction conduct. 115 Additionally, it would ensure that the Commission has an adequate opportunity to perform stress tests on the auction process to identify weaknesses or unanticipated obstacles in the auction, modify the auction design as necessary, and re-test those modifications prior to expending the vast resources necessary to carry out the auctions.

Holding at least two mock auctions would also provide additional transparency to encourage auction participation. At least two mock auctions would provide the Commission with an opportunity to educate broadcasters on how the auction process would work and facilitate dialogue on how the auction could be further simplified or streamlined.

Despite the foregoing, the Commission should ensure that the mock auctions are not used by any party to delay this proceeding. In prior spectrum auctions, the Commission has scheduled mock auctions to occur over the course of one day. While the broadcast spectrum incentive auction is significantly more complicated than past auctions, the Commission should nevertheless strive to conduct the mock auctions as efficiently as possible and not delay the reallocation of the 600 MHz band. As the Commission has noted, mobile broadband is placing growing demands on the available wireless spectrum, and "scarcity of mobile broadband could mean higher prices, poor service quality, an inability for the U.S. to compete internationally, depressed demand, and

<sup>&</sup>lt;sup>115</sup> Auction of AWS-1 and Broadband PCS Licenses, AU Docket No. 08-46, *Public Notice*, 23 FCC Rcd 11850, 11852-53 ¶¶ 14-18 (2008) ("*AWS-1 and PCS Auction Public Notice*"); *see also* Auction of 700 MHz Band Licenses, AU 07-157, *Public Notice*, 23 FCC Rcd 277, 282 ¶¶ 32-35 (2008); Auction of FM Broadcast Construction Permits, 109 Bidders Qualified to Participate in Auction 93, *Public Notice*, 27 FCC Rcd 2385, 2387 ¶ 16 (2012).

 $<sup>^{116}</sup>$  See, e.g., AWS-1 and PCS Auction Public Notice, 23 FCC Rcd at 11852-53 ¶¶ 14-18 (scheduling the mock auction bidding schedule for Monday, August 11, 2008 from 10:00 a.m. ET to 5:00 p.m. ET).

ultimately, a drag on innovation." Accordingly, the Commission should conduct the mock auctions in the proceeding with an eye towards completing the actual auction in 2014.<sup>118</sup>

#### V. CONCLUSION

The incentive auction of television broadcast spectrum challenges the wireless industry, the broadcast industry, and the Commission to reconsider longstanding approaches to spectrum allocation, spectrum assignments, and spectrum relocation. While the choices are not easy or obvious, a band plan that maximizes the availability of paired broadband spectrum while reducing the risk of harmful interference and simplifying device costs promises to reinvigorate the aggressive price, service, and quality competition that have characterized the wireless industry. Meanwhile, a forward auction that expands the number of competitors with valuable, low-frequency spectrum promises not only to raise considerable revenue, but also promote consumer welfare and enhance economic growth. Finally, a reverse auction that simplifies the auction process while strongly rewarding broadcaster participation has the ability to put considerable amounts of valuable radiofrequency spectrum to its highest and best use. With the modest refinements that T-Mobile has proposed, the Commission's incentive auction proposals can realize their full public interest potential in support of consumers, competition, and economic growth nationwide.

<sup>&</sup>lt;sup>117</sup> Federal Communications Commission, Connecting America: National Broadband Plan 77 (2010).

 $<sup>^{118}</sup>$  See NPRM ¶ 10.

### Respectfully submitted,

/s/ Thomas Sugrue

Ari Fitzgerald Trey Hanbury Christopher Termini Philip Berenbroick **Hogan Lovells US LLP** 555 Thirteenth Street, NW Washington, DC 20004 (202) 637-5600

Attorneys for T-Mobile USA, Inc.

January 25, 2013

Thomas Sugrue
Kathleen O'Brien Ham
Steve Sharkey
Christopher Wieczorek
Indra Chalk
Joshua Roland **T-Mobile USA, Inc.**601 Pennsylvania Avenue, NW
Washington, DC 20004
(202) 654-5900